KARTU KONSULTASI SKRIPSI

NamaMahasiswa : Tika Anggraini (1713353044)

JudulSkripsi : Korelasi jumlah CD4dengan kadar viral load pada penderita HIV/AIDS (Studi Pustaka)

Pembimbing Utama : Siti Aminah, S.Pd., M.Kes

No	Hari/Tanggal Bimbingan	Materi	Keterangan	Paraf
1.	Selasa / 29 Desember 2020	Bab I , Bab III	Perbaikan	
2	Sabtu / 2 Januari 2021	Bab I. Bab II, III	Perbaikan	
3	Jum'at / 15 Januari 2021	Bab I. Bab II	Perbaikan	
4	Rabu / 27 Januari 2021	Bab I, Bab III	Perbaikan	
5	Selasa / 2 Februari 2021	Bab I. Bab III	Perbaikan	
6	Rabu / 3 Februari 2021	ACC, Seminar		
7.	Jumat / 30 April 2021	Revisi Bab I, II	Perbaikan	
8.	Selasa / 4 Mei 2021	ACC, perbaikan		
9	Jumat / 4 Juni 2021	Bab IV	Perbaikan	
10	Selasa / 8 Juni 2021	Bab IV, V	Perbaikan	
11	Kamis / 17 Juni 2021	Bab IV. V	Perbaikan	
12	Selasa / 21 Juni 2021	ACC, Seminar hasil		
13	Senin / 26 Juli 2021	Bab IV. V	Perbaikan	
14	Selasa / 10 Agustus 2021	ACC, Cetak		

Ketua Prodi TLM Program
Sarjana Terapan

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Pembimbing pendamping : Filia Yuniza, S.ST.,M.Biomed

No	Hari/Tanggal Bimbingan	Materi	Keterangan	Paraf
1.	kamis / 31 Desember 2020	Bab I, Bab II	Perbaikan	
2.	Senin / 11 Januari 2021	Bab I, Bab II	Perbaikan	
3	Rabu / 27 Januari 2021	Bab III	Perbaikan	
4	Rabu / 3 Februari 2021	Bab III	Perbaikan	
5.	Rabu / 3 Februari 2021		ACC Sempro	
6	Jumat / 30 April 2021	Bab I, II, III	Perbaikan	
7.	Selasa / 4 Mei 2021		ACC, Perbaikan	
8.	Kamis / 17 Juni 2021	Bab IV, V	Perbaikan	
9.	Rabu / 23 Juni 2021	Bab IV, V	Perbaikan	
10	Kamis / 24 Juni 2021		ACC	
11	Senin / 9 Agustus 2021	Bab IV, V	Perbaikan	
12	Selasa / 19 Agustus 2021		ACC	

Ketua Prodi TLM Program Sarjana Terapan

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KORELASI JUMLAH CD4 DENGAN JUMLAH *VIRAL LOAD* PADA PENDERITA HIV/AIDS (STUDI PUSTAKA)

Tika Anggraini
Program Studi Sarjana Terapan Teknologi Laboratorium Medis Politeknik Kesehatan Tanjungkarang

Abstrak

Human immunodeficiency (HIV) merupakan virus yang menyerang sistem kekebalan tubuh manusia, terutama sel CD4 atau sel T-helper. Kumpulan gejala-gejala penyakitnya dikenal sebagai *Acquired Immunodeficiency Syndrome* (AIDS). Jumlah CD4 dan jumlah viral load adalah penanda laboratorium yang secara teratur digunakan untuk manajemen pasien HIV/AIDS selain untuk memprediksi perkembangan penyakit dan / atau hasil pengobatan. *Cluster of Differentiation* 4 (CD4) merupakan penanda atau reseptor pada permukaan sel limfosit T yang menjadi tempat melekatnya virus HIV. Semakin rendah jumlah CD4 semakin besar kerusakan yang diakibatkan oleh virus HIV. Pemeriksaan viral load mencerminkan jumlah replikasi HIV di dalam tubuh.Viral load memberikan ukuran infektivitas yang artinya orang dengan viral load rendah atau tertekan memiliki tingkat penularan yang jauh lebih rendah. Tujuan penelitian yaitu untuk mengetahui korelasi jumlah CD4 dengan jumlah viral load pada penderita HIV/AIDS.Bidang penelitian adalah bidang Immunoserologi. Jenis penelitian ini adalah Studi pustaka menggunakan jurnal ilmiah nasional dan internasional sebagai objek utama. Hasil penelitian didapatkan jumlah CD4 rendah antara 100-600 sel/µl dan jumlah viral load 2000-100.000 kopi/ml serta adanya korelasi negatif yang signifikan antara jumlah CD4 dengan jumlah viral load pada penderita HIV/AIDS. Kesimpulan, terdapat korelasi jumlah CD4 dan jumlah viral load pada penderita HIV/AIDS.

Kata Kunci : CD4, HIV/AIDS, viral load

CORRELATION OF CD4 TOTAL WITH VIRAL LOAD IN HIV/AIDS PATIENTS (LITERATURE REVIEW)

Abstract

Human immunodeficiency (HIV) is a virus that attacks the human immune system, especially CD4 cells or T-helper cells. The collection of symptoms of the disease is known as Acquired Immunodeficiency Syndrome (AIDS). CD4 cell count and viral load are laboratory markers that are regularly used for the management of HIV/AIDS patients in addition to predicting disease progression and/or treatment outcomes. Cluster of Differentiation 4 (CD4) is a marker or receptor on the surface of T lymphocyte cells which is the attachment site for the HIV virus. The lower the CD4 count, the greater the damage caused by the HIV virus. The viral load test reflects the amount of HIV replicating in the body. The viral load provides a measure of infectivity which means that people with a low or depressed viral load have a much lower transmission rate. The aim of the study was to determine the correlation between CD4 cell count and viral load in HIV/AIDS patients. The field of research is Immunoserology. This type of research is a literature study using national and international scientific journals as the main object. The results of the study showed a low CD4 cell count between 100-600 cells/µl and a viral load of 2000-100,000 copies/ml and a significant negative correlation between CD4 cell count and viral load in HIV/AIDS patients. In conclusion, there is a correlation between CD4 cell count and viral load in HIV/AIDS patients.

Keywords: CD4, HIV/AIDS, viral load

Pendahuluan

Kasus HIV AIDS di Indonesia terus meningkat dari tahun ke tahun. Peningkatan kasus HIV terjadi pada tahun 2018 dari 46.650 kasus menjadi 50.282 kasus pada tahun 2019. Kasus AIDS di Indonesia mengalami penurunan dari tahun 2018 dari 10.190 kasus menjadi 7.036 kasus pada tahun 2019 (Ditjen P2P, 2019). Jumlah kasus HIV di Lampung tahun 2019 mengalami kenaikan sebanyak 568 kasus, sedangkan kasus AIDS cenderung menetap di angka 143 kasus. Persentase kasus HIV dan AIDS tahun 2019 pada laki-laki lebih besar dibandingkan perempuan (Dinkes Prov. Lampung, 2019).

Sejak awal HIV/AIDS menjadi epidemi di seluruh dunia, para klinisi telah melakukan pemeriksan jumlah sel CD4 pasien sebagai indikator penurunan sistem imun untuk memantau progresivitas infeksi HIV. Pada pertengahan tahun 1990, mulai dipantau secara rutin viral load HIV, yang secara langsung mengukur jumlah virus HIV dalam darah (Astari, 2009).

Cluster of Differentiation 4 (CD4) merupakan penanda atau reseptor pada permukaan sel limfosit T yang menjadi tempat melekatnya virus HIV. *Cluster of Differentiation* 4 (CD4) merupakan bagian yang sangat penting bagi sistem kekebalan tubuh manusia. Jumlah CD4 menunjukkan tingkat kekebalan tubuh yang berbeda.Semakin rendah jumlah CD4 semakin besar kerusakan yang diakibatkan oleh virus HIV.Sistem imun yang utuh mempunyai jumlah limfosit CD4 berkisar dari 600 sampai 1200 cell/mm³ darah (Suparni, 2013).

Jumlah CD4 merupakan indikator yang yang berguna untuk mengikuti perkembangan penyakit dan berkaitan erat dengan infeksi oportunistik dan kelangsungan hidup pasien (Yanli Ma, 2018). Pada penderita HIV Jumlah CD4 yang berfungsi akan menurun sampai di bawah garis ambang (sekitar 400 sel/ µL) sehingga infeksi oportunistik akan mulai muncul. Jika jumlah sel dibawah 200sel/ µL, individu bersangkutan digolongkan dalam penyandang penyakit AIDS (Subowo, 2010).

Pemeriksaan viral load mencerminkan jumlah replikasi HIV di dalam tubuh.Fungsi terapi anti-retroviral (ARV) adalah untuk menekan viral load hingga mencapai tingkat tidak terdeteksi. Pada tingkatan ini jumlah CD4 akan meningkat dan risiko infeksi oportunistik berkurang (Department of Health and Human Services, 2011). Viral load memberikan ukuran infektivitas yang artinya orang dengan viral load rendah atau tertekan memiliki tingkat penularan yang jauh lebih rendah. Selain itu viral load dapat mengkonfirmasi gagal terapi ARV saat kadar viral load masih berada pada 1000 kopi/ml (Kemenkes, 2019).

Jumlah CD4 dan jumlah viral load adalah penanda laboratorium yang secara teratur digunakan untuk manajemen pasien HIV/AIDS selain untuk memprediksi perkembangan penyakit dan / atau hasil pengobatan (Hoffman et al, 2010). Pasien yang biasanya dengan jumlah limfosit T-CD4 kurang dari 500/mm3 dan HIV RNA viral load lebih dari 10.000 kopi/ml merupakan kandidat untuk mendapatkan terapi anti-retroviral. Pasien dengan kadar viral load yang tinggi dapat mengalami perkembangan menjadi AIDS dalam waktu yang lebih pendek karena adanya produksi virus dalam jumlah besar yang akan membuat kerusakan limfosit T-CD4 sampai dibawah 200 sel/ µL (Astari, 2009). Maka dapat disimpulkan secara singkat bahwa semakin tinggi kadar viral load maka semakin sedikit jumlah CD4.

Menurut penelitian yang dilakukan Haokip et al pada tahun 2018 didapatkan korelasi negatif ($r = -0.54$, $p < 0.00$) yang signifikan secara statistik antara jumlah plasma viral load (PVL) dengan jumlah CD4 pada pasien naif ARV HIV-seropositif, mayoritas orang (89,6%) dengan jumlah CD4 rendah (≤350 sel / µ L) memiliki viral load yang lebih tinggi (≥50.000 kopi / mL) dan dan sebaliknya (66,7% dengan jumlah sel CD4 tinggi> 350 sel / µ L memiliki viral load yang lebih rendah <10.000 kopi / mL).

Menurut penelitian Ranasinghe et al, 2012 didapatkan hasil sel T CD4 khusus HIV berkorelasi terbalik dengan viral load ($p = 0,009$, $r = 0.31$) . Penelitian tersebut sejalan dengan penelitian Nkengfack et al pada tahun 2014 bahwa ada korelasi parsial antara jumlah CD4 dan viral load awal ($r = - 0,190$, $p = 0,017$) yang artinya ketika jumlah CD4 rendah, maka viral load tinggi dan sebaliknya.

penelitian Govender dkk tahun 2014 didapat hasil sebagian besar orang dewasa yang terinfeksi HIV tidak memenuhi syarat untuk ARV langsung pada ambang jumlah CD4 350 sel/ mm³ dan memiliki viral load tinggi. Dari 183 peserta dengan jumlah CD4 0,350 sel / mm³, 62 (34%) memiliki viral load 10.000 eksemplar / ml.

Menurut penelitian yang dilakukan oleh Kumar et al pada tahun 2017 mendapatkan hasil bahwa adanya hubungan antara jumlah CD4 dan *viral load*. didapat nilai r = 0,837

sehingga menunjukkan hubungan yang kuat antara jumlah CD4 dan viral load. Namun menurut peneliatian yang dilakukan Elizabeth Fajar pada tahun 2013 didapat hasil yang tidak signifikan antara jumlah CD4 dan viral load.

Menurut penelitian Yanli Ma et al pada tahun 2018 bahwa viral load pasien AIDS dikaitkan dengan jumlah CD4 T limfosit dan rasio CD4 / CD8. Pada saat yang sama viral load HIV dapat mempengaruhi biosintesis lipid membran limfosit T, sehingga mempengaruhi diferensiasi dan proliferasi limfosit T dan akhirnya mengganggu tanggapan kekebalan yang dimediasi. Oleh karena itu, kadar limfosit CD4 T dan viral load pasien AIDS harus diukur secara teratur untuk memulai terapi antiviral sedini mungkin, sehingga mengurangi kejadian dan angka kematian akibat AIDS.

Berdasarkan uraian latar belakang diatas, maka peneliti tertarik mengadakan penelitian studi literatur mengenai korelasi antara jumlah CD4 dengan kadar viral load pada pasien HIV/AIDS.

Metode Penelitian

Bidang penelitian adalah di bidang imunoserologi. Jenis penelitian ini adalah Studi Pustaka. Variabel yang digunakan dalam penelitian ini yaitu, variabel dependent adalah jumlah CD4 sedangkan varibel independent yaitu jumlah viral load.

Sumber data yang menjadi bahan penelitian ini yaitu sumber data sekunder, berupa jurnal, buku, dan situs internet yang terkait dengan topik yang berkaitan dengan penelitian tentang jumlah CD4 dan jumlah viral load pada penderita HIV/AIDS.

Teknik analisis data yang digunakan dalam penelitian berupa mencari kesamaan (Compare). Peneliti mencari kesamaan dari 15 jurnal (1 jurnal nasional dan 14 jurnal internasional) sebagai sumber data yang berkaitan erat dengan variabel peneliti yaitu jumlah CD4 dan jumlah viral load kemudian peneliti mengambil kesimpulannya.

Hasil

Tabel 4.1 Hasil Pengkajian Studi Pustaka 15 Artikel

No	Penulis, Tahun dan Judul Artikel	Tujuan	Metode Penelitian dan Sampel	Hasil
1	Kumar M, Kumar R, Mahdi AA dan Dhole TN (2017), judul artikel Study of Viral Load and CD4 Count in Diagnosis of HIV-1 Positive Patients	Mengetahui adanya korelasi antara jumlah CD4 dan jumlah Viral load pada pasien positif HIV-1	Penelitian ini merupakan penelitian eksperimental. Data diambil dari 100 kasus (37 laki-laki dan 63 perempuan) dari penderita HIV/AIDS yang berusia antara 18 – 60 tahun. sampel yang dipakai merupakan pasien HIV positif pertama kali.	Adanya korelasi antara nilai jumlah CD4 dan jumlah viral load (r=0,387; nilai p=<0,001). CD4 berbanding terbalik dengan viral load. Didapat Jumlah CD4 < 200 sel/µl memiliki viral load ≥10.000 kopi/ml dan sebaliknya.
2	Sarishen Govender, Kennedy Otwembe, Thendekille Essien, Randre Panchia, Guy de Bruyn, Lerat Mohapi, Glenda Gray, Nein Martinson (2014), Judul artikel CD4 Counts	Mengetahui jumlah CD4 dan viral load pada orang yang belum pernah memakai ART serta menghubungkan	Metode dilakukan dengan cross-sectional dengan total 348 sampel (165 sampel dengan ≤ 350 sel/mm³ dan 183 sampel >350	Adanya korelasi negatif pearson sedang (r = -0,504) antara log 10 viral load dan jumlah CD4 pada semua pasien. Sebagian besar orang

	and viral loads of newly diagnosed HIV-infected individuals: Implications for treatment as prevention	jumlah CD4 yang memenuhi syarat serta jumlah CD4 yang tidak memenuhi syarat untuk memulai ART di Afrika Selatan dengan viral load	sel/mm^3) yang dilakukan antara Maret 2011 dan Oktober 2011.	dewasa yang terinfeksi HIV pada ambang jumlah 350 sel/µl memiliki viral load yang tinggi.
3	Man-Qing Liu, Li Tang, Wen-Hua Kong, Ze-Rong Zhu, Jin-Song Peng, Xia Wang, Zhong-Zhao Yao, Robert Schilling, and Wang Zhou (2013), Judul artikel CD4 T Cell Count, HIV-1 Viral Loads and Demographic Variables of Newly Identified Patients With HIV Infection in Wuhan, China	Mendeskripsikan latar belakang demografis dan status terkait HIV dari orang yang baru didiagnosis HIV khususnya diantara pria berhubungan dengan pria di Wuhan China.	Metode pada penelitian ini adalah studi cross-sectional dengan total sampel 176 pasien yang baru terinfeksi HIV diantaranya 75% laki-laki yang berhubungan seks dengan laki-laki.	Adanya korelasi negatif yang signifikan antara viral load HIV-1 dan CD4 ditemukan dalam kelompok studi secara keseluruhan r = -0,3998; p =0,001.
4	Haokip P, Singh HR, Laldinmawii G, Marak EK, dan Roy A (2018), Judul artikel Quantification of human immunodeficiency virus-1 viral load and its correlation with CD4 cell count in antiretroviral therapy naïve patients attending regional institute of medical sciences hospital, imphal	Mengeksplorasi PVL awal dan korelasinya dengan jumlah CD4 awal pada pasien naif RT seropositif HIV yang baru diidagnosa HIV	Metode pada penelitian ini adalah studi cross-sectional dengan total sampel 82 pasien HIV-seropositif naif ART ≥15 tahun yang menghadiri departemen mikrobiologi pusat perawatan tersier di Timur Laut India dari Agustus 2014 hingga November 2015.	Di antara mereka dengan PVL ≥50.000 kopi / mL, jumlah CD4 adalah> 350 sel/µl dalam 10,4%. Viral Load tidak terdeteksi di 8,5%. Ada korelasi negatif yang signifikan (r = −0,54, p < 0,00) antara jumlah sel Viral Load dan CD4 pada pasien naif ART.
5	Srinika Ranasinghe, Michael Flanders, Sam Culter, Damien Z Soghoian, Musie Ghebremichael, Isaiah Devis, Madelene Lindqvist, Florencia Pereyra, Brunce D Walker, David Heckerman, and Hendrik Streeck (2021), Judul artikel HIV-Specific CD4 T Cell Responses to Different Viral Proteins Have Discordant Associations with Viral Load and Clinical Outcome	Mengetahui respon khusus CD4 dan peptida Gag/Env serta hubungannya dengan viral load	Metode penelitian korelasi rank sperman dengan total sampel 83 orang yang terinfeksi HIV ddi rumah sakit umum Massachusetts. Orang terinfeksi dibagi menjadi kelompok : 43 orang yang baru terinfeksi HIV tanopa ART, 41 orang pelanjut kronis HIV tanpa ART, dan 10 orang dengan ART selama 6 bulan	Hubungan CD4 dan viral load bagi penderita pasien HIV yang belum pernah mendapatkan pengobatan menunujukkan adanya korelasi terbalik yang signifikan r = -0,31 p = 0,0091
6	Yanli Ma, Wenge Zhao, Changhe Shi, Ning Wang, dan Tianli Fan (2017), Judul artikel Effects of HIV	Menganalisis hubungan viral load dengan jumlah sel T CD4	Metode penelitian korelasi rank sperma dengan total sampel sebanyak 150 pasien	Hasil analisis hubungan viral load dan jumlah limfosit T CD4 pada pasien

	on metabolic and biological pathways of CD4+ T lymphocytes	, diferensiasi limfosit T dan metabolit pada penderita AIDS untuk memberikan dasar teori untuk melakukan terapi antivirus sedini mungkin agar mengurangi kejadian dan angka kematian akibat AIDS	yang dibagi menjadi 3 kelompok, i) Viral load > 10^6 kopi / ml (grup A, n = 39), ii) 10^4 kopi / ml <viral load <10^5 kopi / ml (grupB, n = 76), dan iii) viral load <10^4 kopi / ml (kelompok C, n = 35) dengan AIDS pada usia 18-65 dan belum pernah menerima ART yang dirawat di rumah sakit Rakyat Keenam Qingdao (Shandong, Cina) dari bulan Juni 2016 hingga Januari 2017.	AIDS menunjukkan bahwa jumlah limfosit T CD4 subjek pada kelompok A kurang dari 50 sel / µl, terhitung 71,79% dari jumlah keseluruhan kelompok A; sedangkan jumlah limfosit T CD4 pada kelompok B sebagian besar tidak lebih dari 400 sel / µl. Dalam kelompok C, 23 subjek memiliki 200-399 sel / µl jumlah limfosit T CD4 65,71% dari total subjek dalam kelompok C. Dapat disimpulkan bahwa semakin tinggi viral load, semakin rendah T CD4
7	Elizabeth Fajar P,P (2013), judul artikel Hubungan antara stadium klinis, viral load dan jumlah CD4 pada pasien Human Immunodeficiency Virus (HIV) / acquired immunodeficiency syndrome (AIDS)	Mengetahui hubungan antara stadium klinis, viral load dan jumlah CD4 pada pasien HIV/AIDS di RSUP Dr. Kariadi Semarang	Penelitian ini menggunakan observasional analitik, desain cross-sectional. Sampel penelitian sebanyak 86 sample dengan menggunakan rekam medis pasien HIV/AIDS di RSUP Dr. Kariadi Semarang selama periode Maret- Juni 2013 yang diambil dengan cara consequtive sampling	Tidak terdapat hubungan yang bermakna antara viral load degan jumlah CD4. Hal ini berdasarkan data dengan uji chi-square, dimana didapatkan nilai p>0,05 yaitu 0,097
8	Germaine N. Nkengfack, Judith N. Torimiro, Jeanne Ngogang, Sylvia Binting, Stephanie Roll, Peter Tinnemann, Heike Englert (2014), Judul artikel Effects of an HIV-Care-Program on immunological parameters in HIV-positive patients in Yaoundé, Cameroon: A cluster-randomized trial	Mengukur dampak program perawatan HIV dengan fokus pada gizi dan gaya hidup yang diberikan kepada pasien HIV dengan parameter klinis dan antropometri serta status kesehatan pasien	Penelitian ini menggunakan metode rendomized controlled trial dengan total sampel sebanyak 201 pasien penderita HIV.	Ada korelasi negatif parsial antara jumlah CD4 dan viral load awal (r =-0,143,p=0,037)
9	A. P. Twizerimana, J. Mwatha, J. P. Musabyimana,	Menentukan tingkat perubahan	Penelitian ini merupakan	Adanya Koralasi negatif (r=-0,42 dan

	E. Kayigi, J. DeDieu Harelimana, S. M. Karanja and L. Mutesa (2014), Judul artikel Immunological profile HIV positive patients following HAART initiation in Kigali, Rwanda	dan korelasi antara CD4, viral load, IL-10, IL-2 dan IFN-y sebelum ART dan pada 6 bulan pemakaian ART pada pasien HIV positif di Kigali/Rwanda	penelitian longitudinal yang melibatkan 33 pasien terinfeksi HIV yang memenuhi syarat memakai ART yang berlokasi di Kigali.	r=-0,46 pada nilai p<0,05) antara jumlah CD4 dan viral load sebelum ART dan setelah enam bulan pengobatan.
10	R Kannangai, AJ Kandathil, DL Ebenezer, G Nithyanandam, P Samuel, OC A braham, TD Sudarsanam, SA Pulimood, G Sridharan (2008), Judul artikel Evidence For Lower CD4 cell and higher viral load in asymtomatic HIV-1 infected individuals of India : implications for therapy initiation	Mengetahui batas jumlah CD4 dan hubungan dengan tingkat viral load HIV-1 untuk keputusan ART di India selatan	Metode pada penelitian ini adalah studi cross-sectional dengan total sampel darah dari 146 Orang naif pengobatan yang terinfeksi HIV yang datang ke departemen virologi klinis di pusat perawatan tersier di India (selatan) untuk tes pemantauan.	Adanya korelasi negatif yang signifikan (r = -0,55, P < 0,01) antara viral load dan jumlah sel limfosit T CD4 pada orang yang terinfeksi HIV. Mayoritas dengan jumlah CD4 201-350 sel/µL dalam populasi kami memiliki viral load lebih tinggi.
11	Chet Raj Ojha, Geeta Shakya and Shyam Prakash Dumre (2016), Judul artikel Virological and Immunological Status of the People Living with HIV/AIDS Undergoing ART Treatment in Nepal	Upaya mengeksplorasi dan mengekstrak informasi dasar tentang status imunologi dan virologi pasien Nepal yang memakai ART.	Penelian ini merupakan Sebuah studi deskriptif potong lintang dilakukan di pusat perawatan tersier termasuk 826 orang HIV-1 seropositif yang menjalani ART selama setidaknya enam bulan	Adanya hubungan yang signifikan antara parameter virologi dan imunologi (r = 0,028) dengan hubungan timbal balik antara mereka. Hubungan terbalik diamati dengan peningkatan jumlah CD4, viral load ditemukan menurun. Jumlah CD4 <200 sel/µl memiliki viral load >5000 kopi/ml.
12	Yengopal, V., Esan, T. A., & Joosab, Z. (2020), Judul artikel Is there an association between viral load, CD4 count, WHO staging & dental caries in HIV- positive children?	Untuk mengetahui apakah ada hubungan antara jumlah CD4, viral load, stadium WHO.	Penelitian studi analitik cross sectional berbasis catatan yang terdiri dari sampel 355 anak HIV + yang nyaman, antara usia 4-12 tahun, menghadiri Rumah Sakit Charlotte Maxeke, Johannesburg, Afrika Selatan selama periode lima tahun (2013-2018)	Hubungan terbalik yang signifikan antara viral load dan jumlah CD4 yang menyiratkan bahwa viral load yang tinggi dikaitkan dengan penurunan jumlah CD4.
13	Jitendra Panda, Nitya Vyas, Aditya Mishra , Babita Sharma (2019),	Untuk mengetahui korelasi antara jumlah CD4 &	Penelitian studi analitik cross sectional dilakukan	korelasi negatif yang signifikan secara statistik antara viral

	Judul artikelCorrelation between CD4 Count and HIV-1 Viral Load among ART Naive Patients Attending ICTC, SMS Medical College, Jaipur.	Viral load HIV-1 di antara pasien naif ART yang menghadiri ICTC SMS Medical College, Jaipur	pada 250 kasus HIV yang dikonfirmasi secara serologis, kasus ART Naif dari ICTC, SMS Jaipur.	load HIV-1 dan jumlah CD4 pada pasien naif ART HIVseropositif pada sebagian besar orang. Rata-rata viral load adalah 194.746 ± 5.504.421 kopi / ml sedangkan jumlah CD4 adalah 282 ± 217sel / ul.
14	Loukia Aketi, Pierre M. Tshibassu, Patrick K. Kayembe, Faustin Kitetele, Samuel Edidi, Mathilde B. Ekila, Roger Wumba, Francois B. Lepira, Michel N. Aloni (2015), Judul artikel Simple markers for the detection of severe immunosuppression in children with HIV infection in highly resource-scarce settings: experience from the Democratic Republic of Congo	mengidentifikasi penanda klinis dan biologis sederhana selain CD4 menghitung dan mengukur viral load yang dapat membantu keputusan untuk memperkenalkan pengobatan antiretroviral dan memantau pasien	Penelitian studi analitik cross sectional dilakukan antara Januari dan Maret 2005 di Kinshasa, Republik Demokratik Kongo dengan jumlah sampel Delapan puluh empat anak yang terinfeksi HIV	CD4 menunjukkan korelasi signifikan yang negatif dengan viral load (r=-0,285)
15	Yujing Qian, ZunyouWu, Chao Chen, Kuifang Du, WenbinWei (2020), Judul artikel Detection of HIV-1 viral load in tears of HIV/AIDS patients	untuk mengetahui viral load HIV-1 pada pasien HIV / AIDS dan mempelajari faktor-faktor yang mempengaruhi viral load air mata mereka	penelitian studi cross-sectional dilakukan pada 67 pasien dengan infeksi HIV-1 atau AIDS yang dikonfirmasi dari Rumah Sakit You'an Beijing, Cina antara April 2018 dan September 2018. Pada saat yang sama, pemeriksaan mata dilakukan dan sampel air mata diuji.	Viral load pada air mata mempunyai korelasi sigifikan yang negatif dengan jumlah sel T CD4 (Rho = - 0,450, p<0,001)

Pada Tabel 4. 1 didapatkan hasil penelitian kajian pustaka di atas terdapat 14 artikel yang menyatakan adanya korelasi antara jumlah CD4 dengan jumlah viral load pada penderita HIV/AIDS dan terdapat 1 artikel yang menyatakan tidak adanya korelasi.

Tabel 4. 2 Jumlah CD4 dan jumlah viral load

No	Nama Penulis dan Tahun	Jumlah CD4 (sel/µl)	Jumlah Viral Load (kopi/ml)	Keterangan
1	Kumar M (2017)	100 – 500	10.000 – 100.000	Terdapat Korelasi
2	Sarishen Govender (2014)	238 – 542	2.050 – 98. 171	Terdapat Korelasi

3	Man-Qing Liu (2013)	100 - 499	40.000 - 20.000	Terdapat Korelasi
4	Haokip P (2018)	110 – 441	3.662 – 88.700	Terdapat Korelasi
5	Srinika Ranasinghe (2021)	300 – 500	10.000 – 50.000	Terdapat Korelasi
6	Yanli Ma (2017)	200 – 399	6.200 – 38.000	Terdapat Korelasi
7	Elizabeth Fajar P,P (2013)	≤ 200	Tidak terdeteksi	Tidak Terdapat Korelasi
8	Germaine N (2014)	500 – 600	30.000 – 50.000	Terdapat Korelasi
9	A. P. Twizerimana (2014)	200 – 500	20.000 – 50.000	Terdapat Korelasi
10	R Kannangai (2008)	201 – 350	30.000 – 70.000	Terdapat Korelasi
11	Chet Raj Ojha (2016)	325 – 579	5.000 – 25.000	Terdapat Korelasi
12	Yengopal (2020	200 – 500	20.000 – 50.000	Terdapat Korelasi
13	Jitendra Panda (2019)	250 – 500	10.000 – 40.000	Terdapat Korelasi
14	Loukia Aketi (2015)	200 – 500	20.000 – 50.000	Terdapat Korelasi
15	Yujing Qian (2020)	315 - 542	4.350 – 52.593	Terdapat Korelasi

Pembahasan

Berdasarkan pada hasil penelusuran kajian pustaka pada tabel 4.1 diatas terdapat 15 artikel (14 artikel internasional dan 1 artikel nasional) yang mengulas hubungan jumlah CD dan jumlah viral load. 14 artikel menyatakan adanya korelasi negatif yang signifikan antara jumlah CD4 dan jumlah viral load pada penderita HIV/AIDS serta 1 artikel yang menyatakan hasil tidak ada korelasi yang signifikan antara jumlah CD4 dan jumlah viral load pada penderita HIV/AIDS.

a. Gambaran jumlah CD4 pada penderita HIV/AIDS

Jumlah CD4 memberikan informasi tentang fungsi kekebalan tubuh secara keseluruhan dari pasien yang terinfeksi HIV/AIDS.Pemeriksaan ini penting untuk melihat perkembangan penyakit yang berkaitan erat dengan gejala oportinistik dan untuk memulai ARV (Kumar et al, 2015).Jumlah normal CD4 berkisar antara 500-2000 sel/µl. Setelah seropositif, CD4 biasanya berada dalam jumlah rendah (rata-rata 700 sel/µl) (Hull, MW et al, 2012).

Dari 15 artikel didapatkan hasil yang serupa dengan pernyataan tersebut yaitu jumlah CD4 cenderung rendah berada antara 100-600 sel/µl dengan pasien seroposif maupun yang sudah memakai ARV pada penderita HIV/AIDS.

b. Gambaran jumlah viral load pada penderita HIV/AIDS

Pemeriksaan viral load digunakan untuk menghitung beban virus HIV dalam tubuh, selain itu pemeriksaan viral load memberikan informasi tambahan untuk memulai ARV serta memantau ARV terutama pasien yang memiliki jumlah CD4 yang relatif tinggi serta menunjukkan resiko penularan HIV pada tingkat individu dan populasi (Haokip et al, 2018).

Normalnya jumlah viral load tidak terdeteksi, namun pada penderita HIV/AIDS ditemukan jumlah viral load.Berdasarkan 14

artikel yang sudah dikaji ditemukan jumlah viral load sebesar 2000-100.000 kopi/ml.

c. Korelasi jumlah CD4 dengan jumlah viral load pada penderira HIV/AIDS

Viral load menggambarkan jumlah replikasi HIV di dalam tubuh dan jumlah CD4 mewakilkan jumlah sel target yang terinfeksi HIV. Setelah HIV masuk kedalam tubuh, virus HIV/AIDS terus berlanjut berkembang biak secara aktif dan membunuh sel-sel kekebalan tubuh (sel CD4).Jika HIV dapat memasuki sel CD4, virus dapat mengambil alih sel dan kemudian menggunakannya untuk menduplikat dirinya sendiri (replikasi).Saat HIV memproduksi Lebih banyak salinan dirinya sendiri, jumlah sel CD4 menurun (Ma Yanli, 2017).

Pasien dengan jumlah viral load yang tinggi yang artinya adanya produksi virus dalam jumlah besar akan membuat kerusakan limfosit TCD4 sampai dibawah 200 sel/µl menyebabkan pasien mengalami perkembangan penyakit menjadi AIDS (Astari, 2009).Rendahnya jumlah sel CD4 pada ODHA memungkinkan munculnya beberapa infeksi oportunistik akan meningkat, akhirnya kualitas hidup dipertaruhkan (Chatterjee et al., 2016).

Terdapat 14 artikel yang menyatakan adanya korelasi negatif yang signifikan berasal dari sampel pasien yang baru terinfeksi HIV dan belum pernah memakai ARV didapatkan serta pasien yang sudah memakai ARV minimal 6 bulan pemakaian. Didapatkan hasil jika jumlah CD4 $\geq$ 350 sel/µl maka jumlah viral load $\leq$ 10.000 kopi/ml dan jika jumlah CD4 $\leq$ 350 sel/µl maka jumlah viral load $\geq$ 50.000 kopi/ml. Hasil ini menyatakan bahwa semakin rendah jumlah CD4 maka semakin tinggi jumlah viral load dan semakin tinggi jumlah CD4 maka semakin rendah jumlah viral load pada penderita HIV/AIDS.

Adapun penelitian Elizabeth Fajar P,P (2013) menyatakan tidak didapatkan hubungan yang bermakna antara viral load dan jumlah CD4.Penelitian ini bertentangan dengan 14 artikellain yang menyatakan adanya korelasi negatif yang signifikan antara jumlah CD4 dan viral load pada penderita HIV/AIDS. Banyaknya pasien dengan jumlah < 350 sel/µl tidak terdeteksi viral loadnya atau <50 kopi/ml. Perbedaan hasil ini kemungkinan disebabkan oleh sampel yang dipakai penelitian ini sudah mengkonsumsi ARV dan tidak mempunyai kriteria yang khusus.

Pemeriksaan jumlah CD4 dan jumlah viral load diperlukan untuk pemantauan penggunaan ARV. Berdasarkan Pedoman WHO tahun 2016 merekomendasikan bahwa ARV dapat dimulai terlepas dari jumlah CD4 dan pemantauan jumlah CD4 dapat dihentikan pada pasien yang menggunakan ARV stabil dan kemanjuran ARV setelah itu dapat dipantau dengan viral load. Walaupun terapi ARV saat ini diindikasikan pada semua ODHA tanpa melihat jumlah CD4-nya, pemeriksaan jumlah CD4 awal tetap dianggap penting, apalagi di Indonesia dimana masih banyak ODHA yang didiagnosis HIV pada kondisi lanjut.

Pemeriksaan viral load sangat penting mengingat fungsi dari ARV untuk menekan jumlah virus pada tubuh pasien tetapi jumlah CD4 tetap diperlukan untuk menentukan indikasi pemberian profilaksis infeksi oportunistik karena stadium klinis juga tidak selalu sesuai dengan jumlah CD4 seseorang (Kemenkes, 2019).

Kesimpulan

Hasil penelitian dapat disimpulkan :

1. Jumlah CD4 cenderung rendah antara 100 - 600 sel/µl pada pasien penderita HIV/AIDS.
2. Viral load yang terdeteksi pada pasien penderita HIV/AIDS sebesar 2000 - 100.000 kopi/ml.
3. Adanya korelasi negatif yang signifikan antara jumlah CD4 dengan jumlah viral load pada penderita HIV/AIDS, Hasil ini karena sebagian besar artikel menyatakan semakin rendah jumlah CD4 maka semakin tinggi jumlah viral load pada penderita HIV/AIDS dan sebaliknya.

Daftar Pustaka

A. P. Twizerimana *et al.* 2014. Immunological profiles in HIV positive patients following haart initiation in Kigali, Rwanda. *East Afr. Med. J.*, vol. 91, no. 8, pp. 261–266.

Adan A., Alizada G., Kiraz Y., Baran Y., Nalbant A. 2017. *Flow cytometry: basic principles and applications*. Critical Reviews in Biotechnology, 37(2), 163–176.

Aketi, L., Tshibassu, P. M., Kayembe, P. K., Kitetele, F., Edidi, S., Ekila, M. B.& N. Aloni, M. (2015). Simple markers for the detection of severe immunosuppression in children with HIV infection in highly resource-scarce settings: experience from the Democratic Republic of Congo. Pathogens and global health, 109(6), 300-304.

Astari, Linda, Sawitri, Yunia Eka Safitri, and Desy Hinda dan P. 2009. Viral Load Pada Infeksi HIV. Telaah Kepustakaan 21 (1): 31–39.

Baratawidjaja, K, G, Iris, R. 2010. *Imunologi Dasar Edisi Ke-9*.Balai Penerbit FKUI, Jakarta.

Chandra Budiman. 2012. *Kontrol Penyakit Menular Pada*. Kedokteran EGC, Jakarta.

Ciccaglione, A. R., Miceli, M., Pisani, G., Bruni, R., Iudicone, P., Costantino, & Palombi, L. 2010. Improving HIV-2 detection by a combination of serological and nucleic acid amplification test assays. Journal of clinical microbiology, 48(8), 2902-2908.

Daili, S, F, Wresti, I, B, M, Farida, Z (Ed.) 2014.*Infeksi Menuar Seksual Edisi Keempat*. Badan Penerbit FKUI, Jakarta..

Department of Health and Human Services. 2011. Guidelines for The Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents. pp.1-174.

Dinas Kesehatan Provinsi Lampung, 2019, Profil Dinkes Provinsi Lampung 2019, Bandar Lampung, di akses tanggal 14 Agustus 2019.

Durman, E. 2012.Diagnosis Serologis Infeksi Human Immunodeficiency Virus. Majalah Kedokteran FK UKI, 28(3), 126-132.

Eholie SP, Badje A, Kouame GM, et al. 2016. Antiretroviral treatment regardless of CD4 count: the universal answer to a contextual question; 13:27.

Fajar P.P, E 2013, Hubungan Antara Stadium Klinik, Viral Load dan Jumlah CD4 pada Pasien HIV/AIDS di RSUP dr. Kariadi Semarang, Fakultas Kedokteran Universitas Diponegoro, Semarang

Ford, N., Meintjes, G., Vitoria, M., Greene, G., & Chiller, T. 2017. The evolving role of CD4 cell counts in HIV care. Current Opinion in HIV and AIDS, 12(2), 123-128.

G. N. Nkengfack, J. N. Torimiro, and J. Ngogang. 2014. Pengaruh Program Perawatan HIV pada parameter imunologi pada pasien HIV-positif di Yaoundé , Kamerun : uji coba cluster-random. pp. 509–517.

Hoffmann, M., Hilton-Taylor, C., Angulo, A., Böhm, M., Brooks, T. M., Butchart, S. H.& Veloso, A. 2010. The impact of conservation on the status of the world's vertebrates. science, 330(6010), 1503-1509.

Irianto, Koes. 2014. *Epidemiologi Penyakit Menular & Tidak Menular*. Alfabeta, Bandung.

Kannangai, R., Kandathil, A. J., Ebenezer, D. L., Nithyanandam, G., Samuel, P., Abraham, O. C.& Sridharan, G. 2008. Evidence for lower CD4+ T cell and higher viral load in asymptomatic HIV-1 infected individuals of India: implications for therapy initiation. Indian journal of medical microbiology, 26(3), 217-221.

Kemenkes RI. Keputusan Menteri Kesehatan Republik Indonesia Nomor Hk.01.07/Menkes/90/2019 tentang Pedoman Nasional Pelayanan Kedokteran Tata Laksana HIV. 2019.

Kunoli, F, J. 2013. *Pengantar Epidemiologi Penyakit Menular*. CV. Trans Info Media, Jakarta..

Laporan Situasi Perkembangan HIV AIDS dan PIMS di Indonesia, Triwulan III Tahun 2019.Jakarta : Kementerian Kesehatan RI, 2019

Liu, M. Q., Tang, L., Kong, W. H., Zhu, Z. R., Peng, J. S., Wang, X& Zhou, W. 2013. CD4+ T cell count, HIV- 1 viral loads and demographic variables of newly identified patients with HIV infection in Wuhan, China. *Journal of medical virology*, *85*(10), 1687-1691.

M. Kumar. 2017. Study of Viral Load and CD4 Count in Diagnosis of HIV-1 Positive Patients. J. Fam. Med., vol.4, no.4, pp 4–6, doi: 10.26420/jfammed.2017.1117.

Ojha, C. R., Shakya, G., & Dumre, S. P. (2016).Virological and immunological status of the people living with HIV/AIDS undergoing ART treatment in Nepal. BioMed research

international, 2016.

P. Haokip, H. R. Singh, G. Laldinmawii, E. K. Marak, and A. Roy. 2018. Quantification of human immunodeficiency virus-1 viral load and its correlation with cd4 cell count in antiretroviral therapy naïve patients attending regional institute of medical sciences hospital, imphal. JMS - J. Med. Soc., vol. 32, no. 2, pp. 98–102 , doi: 10.4103/jms.jms_107_16.

Panda Jitendra, Vyas Nitya, Mishra Aditya, Sharma Babita. 2019. Correlation between CD4 Count and HIV-1 Viral Load among ART Naive Patients Attending ICTC, SMS Medical College, Jaipur. Int J Med Res Prof ; 5(4); 282-84.

Qian, Y., Wu, Z., Chen, C., Du, K., & Wei, W. (2020).Detection of HIV-1 viral load in tears of HIV/AIDS patients. Infection, 48(6), 929-933.

R. Jones. 2014. Validation of CD4+ T-cell and viral load data from the HIV-Brazil Cohort Study using secondary system data. Bone, vol. 23, no. 1, pp. 1–7, doi: 10.1111/tmi.12079.The.

Rohan, H, H, Sandu, S 2013.*Buku Ajar: Kesehatan Reproduksi*. Nuha Medika, Yogyakarta.

S. Govender et al. 2014. CD4 Counts and viral loads of newly diagnosed HIV-infected individuals: Implications for treatment as prevention, .PLoS One, vol. 9, no. 3, pp. 1–6, doi: 10.1371/journal.pone.0090754.

S. Ranasinghe et al. 2012. HIV-Specific CD4 T Cell Responses to Different Viral Proteins Have Discordant Associations with Viral Load and Clinical Outcome. J. Virol., vol. 86, no. 1, pp. 277–283, doi: 10.1128/jvi.05577-11.

Soedarto. 2010. *Virologi Klinik*. CV Sagung Seto,Jakarta

Subowo. 2010. *Imunologi Klinik Edisi Kedua*. CV Sagung Seto, Jakarta.

Suparni, 2013.Hubungan antara Pola Hidup terhadap Kondisi Fisik Penderita HIV yang Berobat di Rumah Sakit Dr. Iskak Tulungagung.Politeknik Kesehatan Surabaya.

Widoyono. 2011. *Penyakit Tropis - Epidemiologi, Penularan, Pencegahan & Pemberantasannya Edisi Kedua*. Erlangga, Jakarta.

Widyasih, H., & Wahyuningsih, H. P. 2019.Hubungan Antara Lama Terdiagnosa Dengan Kualitas Hidup Orang DenganHIV/AIDS di Yayasan Victory Plus Tahun 2019. Doctoral dissertation, Poltekkes Kemenkes Yogyakarta.

World Health Organization. 2017. Antiretroviral therapy for HIV infection in adults and adolescents: recommendations for a public health approach. 2nd Edition Geneva: WHO.

Y. Ma, W. Zhao, C. Shi, N. Wang, and T. Fan. 2018. Effects of HIV on metabolic and biological pathways of CD4+ T lymphocytes. *Exp. Ther. Med.*, vol. 15, no. 3, pp. 2946–2950, doi: 10.3892/etm.2018.5749.

Yengopal, V., Ayodeji Esan, T., & Joosab, Z. (2021). Is there an association between viral load, CD4 count, WHO staging, and dental caries in HIV- positive children?. International Journal of Paediatric Dentistry, 31(2).

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CD4 Counts and Viral Loads of Newly Diagnosed HIV-Infected Individuals: Implications for Treatment as Prevention

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Abstract

Objective: To report the viral load and CD4 count in HIV-infected, antiretroviral naïve, first -time HIV-testers, not immediately eligible for treatment initiation by current South Africa treatment guidelines.

Design: This was a cross-sectional study in a high-volume, free-of-charge HIV testing centre in Soweto, South Africa.

Methods: We enrolled first time HIV testers and collected demographic and risk-behaviour data and measured CD4 count and viral load.

Results: Between March and October 2011, a total of 4793 adults attended VCT and 1062 (22%) tested positive. Of the 1062, 799 (75%) were ART naïve and 348/799 (44%) were first-time HIV testers. Of this group of 348, 225 (65%) were female. Overall their median age, CD4 count and viral load was 34 years (IQR: 28-41), 364 (IQR: 238-542) cells/mm^3 and 13,000 (IQR: 2050-98171) copies/ml, respectively. Female first time HIV testers had higher CD4 counts (419 IQR: 262-582 vs. 303 IQR: 199-418 cells/mm^3) and lower viral loads (9,100 vs. 34,000 copies/ml) compared to males. Of 183 participants with CD4 count >350 cells/mm^3, 62 (34%) had viral loads > 10,000 copies/ml.

Conclusions: A large proportion of HIV infected adults not qualifying for immediate ART at the CD4 count threshold of 350 cells/mm^3 have high viral loads. HIV-infected men at their first HIV diagnosis are more likely to have lower CD4 counts and higher viral loads than women.

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Introduction

Anti-retroviral therapy (ART) initiation has been shown to dramatically reduce HIV transmission in discordant heterosexual couples prompting revisions to treatment eligibility criteria. [1–3] Responding to this, new guidelines recommend starting ART either at HIV diagnosis, or at CD4 counts of ≤500 cells/mm^3. [4,5] Current South African (SA) treatment guidelines for ART include recommendations for treatment initiation at a CD4 threshold of ≤ 350 cells/mm^3 in non-pregnant, well adolescents and adults.[4,5].

ART initiation is traditionally based on CD4 counts. In conjunction with viral loads, they allow prognostication. [6] Moreover, viral loads provide a measure of infectivity; individuals with low or suppressed viral loads have markedly lower transmission rates. [7,8]

This study reports the distribution of CD4 counts and viral loads in ART-naïve, first-time HIV testers and relates CD4 counts to current South African ART initiation thresholds, and the proportion of participants not qualifying for immediate initiation of ART by the CD4 criterion but who have high viral loads and high potential of onward HIV transmission.

Materials and Methods

We analysed data collected at the ZAZI clinic which is a free-of-charge, voluntary counselling and testing (VCT) facility on the campus of the Chris Hani Baragwanath Academic Hospital in Soweto, South Africa. The clinic is connected by a pedestrian bridge to a busy taxi rank. ZAZI tested 15,824 walk-in patients from October 2010 to September 2011. Participants included in this analysis had to be ART-naïve, self-report being HIV tested for the first time, and have no clinical evidence of an AIDS defining condition (WHO Stage 1 or 2 diseases).

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Research Article

Study of Viral Load and CD4 Count in Diagnosis of HIV-1 Positive Patients

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Abstract

This study reports the distribution of CD4 counts and viral loads in first-time HIV positive patients.

One hundred cases of different kinds of HIV/AIDS were included in this study. Written consent was obtained from each participant for their information to be stored in the clinic database and used for research purposes. Blood samples were collected from these volunteers in the sterilized vials and processed for CD4 count and viral load.Data were analyzed with statistical package (SPSS 16.0) software and correlation coefficients and correlation matrix were determined.

One hundred cases (37 males and 63 females) of different kinds of HIV/AIDS were included in this study with a mean age ranged from 33.45 ± 13.052. Half of the patients below 29 years of age and only 4% are above 59 years of age. Relationship between the CD4 cell count and the dependent variable viral load. R, the multiple correlation coefficients, is the linear correlation between the observed and predicted values of the dependent variable viral load. Its large value indicates a strong relationship between CD4 cell count values and viral load (R=0.837). If R value is small, then it takes large errors. For R square 0.701, nearly one third the variation in viral load is explained by the independent variable CD4 cell count. The Gender wise mean comparison of viral load in CD4 positive patients was found significant ($p<0.05$).

HIV-infected men at their first HIV diagnosis are more likely to have lower CD4 counts and higher viral loads than women.

Keywords: CD4 Count; Viral Load; HIV Patients; Diagnosis; Gender

Introduction

HIV RNA (viral load) and CD4 T lymphocyte (CD4) cell count are the two surrogate markers of antiretroviral treatment (ART) responses and HIV disease progression that have been used for decades to manage and monitor HIV infection. Viral load is the most important indicator of initial and sustained response to ART (AI) and should be measured in all HIV-infected patients at entry into care (AIII), at initiation of therapy (AIII), and on a regular basis thereafter.

Viral load is a marker of response to ART. A patient's pre-ART viral load level and the magnitude of viral load decline after initiation of ART provide prognostic information about the probability of disease progression [1]. The key goal of ART is to achieve and maintain durable viral suppression. Thus, the most important use of the viral load is to monitor the effectiveness of therapy after initiation of ART [2].

Measurement of CD4 count is particularly useful before initiation of ART. The CD4 cell count provides information on the overall immune function of an HIV-infected patient [3,4]. The measurement is critical in establishing thresholds for the initiation and discontinuation of opportunistic infection (OI) prophylaxis and in assessing the urgency to initiate ART.

This study reports the distribution of CD4 counts and viral loads in first-time HIV positive patients.

Materials and Methods

One hundred cases of different kinds of HIV/AIDS were included in this study. Written consent was obtained from each participant for their information to be stored in the clinic database and used for research purposes. Their age ranged between 18-60 years. All these subjects were selected from Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India. Blood samples were collected from these volunteers in the sterilized vials and processed for CD4 count and viral load. Viral Load testing was conducted using the Nuclisens Nucleic Acid Sequence Based Amplification (NASBA, bioMerieux,

Table 1: Distribution of age at different intervals with CD4 positivity in Case group.

Age	Cases (N=100)			
	CD4 +ve (n=73)		CD4 -ve (27)	
	N	%	N	%
Less than 29	32	43.84	7	25.93
between 29 to 39	16	21.92	9	33.33
between 40 to 49	11	15.07	3	11.11
between 50 to 59	11	15.07	7	25.93
Above 59	3	4.11	1	3.70

Applied $\chi 2$ test for significance. P value = 0.413.

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CD4+ T Cell Count, HIV-1 Viral Loads and Demographic Variables of Newly Identified Patients With HIV Infection in Wuhan, China

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In China, the rate of human immunodeficiency virus (HIV) testing is increasing among men who have sex with men. The purpose of the present study was to describe HIV-related biomarkers and selected demographic variables of persons with newly diagnosed HIV/AIDS, among men who have sex with men in particular, in Wuhan China. Demographic indicators, and CD4+ T cell counts and HIV-1 viral load were collected from individuals newly identified as HIV-1 antibody positive during 2011. Of 176 enrolled patients, 132 (75.0%) were men who have sex with men. This group was significantly younger and had higher CD4+ T cell counts than patients who were likely infected through heterosexual contact. Most men who have sex with men (56.6%) were discovered by initiative investigation. Among heterosexual patients CD4+ T cell counts and HIV-1 viral load were significantly correlated; among the group of men who have sex with men, no such association was found. ***J. Med. Virol. 85:1687–1691, 2013.***

KEY WORDS: men who have sex with men; heterosexual; CD4+ T cell counts; HIV-1 viral load; Wuhan

INTRODUCTION

Since the first case of human immunodeficiency virus (HIV) infection in China was recognized in the early 1980s, HIV has spread to all of mainland China. By the end of 2011, an estimated 780,000 individuals were living with HIV/AIDS in China [Lu et al., 2008; Ministry of Health et al., 2011]. By 2008, sexually transmitted infections and HIV accounted for 39% of all deaths due to infectious disease in China [Zhang and Wilson, 2012]. In 2011, heterosexuals, men who have sex with men and injecting drug users were respectively 46.5%, 17.4%, and 28.4% of persons with HIV/AIDS [Ministry of Health et al., 2011]. Although the spread of HIV in Asia was in the past driven largely by sex work and injecting drug use [Ruxrungtham et al., 2004], HIV infection is spreading rapidly among men who have sex with men in China. In 2003, China launched the "Four Frees, One Care" policy and the Chinese Center for Disease Control and Prevention expanded free HIV voluntary counseling and testing for "high-risk" populations. The proportion of men who have sex with men who have been tested for HIV has increased from 10.8% in 2002 to 51.2% in 2009 [Chow et al., 2012]. Notwithstanding the advances in HIV testing programs and campaigns targeting men who have sex with men, HIV testing remains insufficient among this population in many parts of China [Chow et al., 2012].

The purposes of the present study were to describe the demographic background and HIV-related status of persons with newly diagnosed HIV/AIDS, and in particular, among men who have sex with men, in Wuhan China. During 2011, demographic indicators, and CD4+ T cell counts and HIV-1 viral load were collected from patients newly identified as HIV-1 antibody positive.

CD4+ T cell count and plasma HIV-1 viral load are the markers of the progression of HIV-1 infection [Pachl et al., 1995; Saag et al., 1996; Mellors et al., 1997]. CD4+ T cells are the primary targets of HIV, and counts of these cells serve as indicators of disease progression and antiretroviral therapy effectiveness.

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Original Article

Quantification of human immunodeficiency virus-1 viral load and its correlation with CD4 cell count in antiretroviral therapy naïve patients attending Regional Institute of Medical Sciences Hospital, Imphal

ABSTRACT

Background: While the CD4 cell count plays a pivotal role for antiretroviral therapy (ART) initiation, plasma viral load (PVL) provides additional guiding information, especially in patients with a relatively high CD4 cell count. This study was carried out to quantify PVL and CD4 cell count in ART naïve cases and determine their correlation.

Materials and Methods: A cross-sectional study was conducted on 82 ART naïve patients of ≥15 years of age attending the Fluorescent Activated Cell Sorter Count (FACSCount) center, Department of Microbiology at a tertiary care center after the Institutional Ethics Committee approval, from August 2014 to November 2015. Blood samples were collected after obtaining written informed consent. PVL was quantified by COBAS® TaqMan® human immunodeficiency virus type 1 (HIV-1) version 2.0 Test and CD4 cell count was measured by FACSCount™ System. The correlation analysis was performed by Pearson's correlation test (*r*) using SPSS 16.0 software.

Results: In this study, mean PVL and CD4 cell counts were 108,000 ± 206,200 copies/mL and 348.2 ± 296 cells/μL, respectively. Among those with PVL ≥50,000 copies/mL, CD4 cell count was >350 cells/μL in 10.4%. PVL was not detectable in 8.5%. There was significant negative correlation ($r = -0.54$, $P < 0.00$) between PVL and CD4 cell count in ART naïve patients.

Conclusion: Consideration of PVL in ART initiation guidelines for those with CD4 cell count >350 cells/μL will maximize ART coverage of highly infectious ART naïve patients, which in turn will reduce the risk of HIV transmission at individual and population level.

Keywords: Antiretroviral therapy, antiretroviral therapy naïve, CD4 cell count, plasma viral load

INTRODUCTION

Quantification of human immunodeficiency virus type 1 (HIV-1) ribonucleic acid (RNA) copies per milliliter of plasma (i.e., viral load) is used as a marker of risk of disease progression,[1] to decide when to initiate antiretroviral therapy (ART) in ART naïve patients and to monitor response to ART.[1,2] Plasma viral load (PVL) indicates the risk of HIV transmission at the individual and population levels[3,4] and is a useful technique to diagnose HIV infection in infants.[5]

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HIV-Specific CD4 T Cell Responses to Different Viral Proteins Have Discordant Associations with Viral Load and Clinical Outcome

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A successful prophylactic vaccine is characterized by long-lived immunity, which is critically dependent on CD4 T cell-mediated helper signals. Indeed, most licensed vaccines induce antigen-specific CD4 T cell responses, in addition to high-affinity antibodies. However, despite the important role of CD4 T cells in vaccine design and natural infection, few studies have characterized HIV-specific CD4 T cells due to their preferential susceptibility to HIV infection. To establish at the population level the impact of HIV-specific CD4 T cells on viral control and define the specificity of HIV-specific CD4 T cell peptide targeting, we conducted a comprehensive analysis of these responses to the entire HIV proteome in 93 subjects at different stages of HIV infection. We show that HIV-specific CD4 T cell responses were detectable in 92% of individuals and that the breadth of these responses showed a significant inverse correlation with the viral load ($P = 0.009$, $R = -0.31$). In particular, CD4 T cell responses targeting Gag were robustly associated with lower levels of viremia ($P = 0.0002$, $R = -0.45$). Importantly, differences in the immunodominance profile of HIV-specific CD4 T cell responses distinguished HIV controllers from progressors. Furthermore, Gag/Env ratios were a potent marker of viral control, with a high frequency and magnitude of Gag responses and low proportion of Env responses associated with effective immune control. At the epitope level, targeting of three distinct Gag peptides was linked to spontaneous HIV control ($P = 0.60$ to 0.85). Inclusion of these immunogenic proteins and peptides in future HIV vaccines may act as a critical cornerstone for enhancing protective T cell responses.

The role of CD4 T cell responses in the control of several chronic viral infections has been well characterized (28), yet surprisingly little is known about the presence of these responses in the setting of HIV infection. In particular, the contribution of HIV-specific CD4 T cell responses to viral control is unclear, and the qualitative differences between efficacious responses and inadequate responses have not been comprehensively investigated at the level of individual proteins and peptides. The identification of the specificities and efficacies of these responses is likely to be vital for HIV vaccine design, since any protein-based vaccines will most likely induce some degree of HIV-specific CD4 T cells. Indeed, a modest protective effect was recently observed in the RV144 "Thai trial" HIV vaccine (11, 19), which not only elicited nonneutralizing antibody responses but also induced HIV-specific CD4 T cell responses in vaccinees. Moreover, it will be important to identify which HIV-specific CD4 T cells are induced in natural HIV infection in order to successfully augment the efficacy of these responses in future vaccines.

There is a growing body of evidence that HIV-specific CD4 T cells may enhance immunological control of HIV viremia either by providing help for CD8 T and B cells (5) or by direct antiviral effects (14, 22). In particular, studies have demonstrated that the presence of HIV-specific CD4 T cells is enriched in individuals spontaneously able to control viral replication in the absence of antiretroviral therapy (8, 16, 21). Furthermore, the presence of HIV-specific CD4 T cells in highly exposed but HIV-seronegative individuals also suggests a protective role for this cellular subset (20). In addition, it is important to note that although a small percentage of HIV-specific CD4 T cells are preferentially targeted by HIV, the vast majority of these cells remain uninfected at all times *in vivo* (6), where they are likely to mediate an important antiviral role.

Currently, only a small fraction of HIV-specific CD4 T cell responses have been identified. The specificities of the individual peptide responses have not been analyzed, since previous studies predominantly utilized peptide pools (2, 9, 18) or assessed the polyfunctionality of these responses to a single HIV protein (8). Thus, our study represents the first comprehensive analysis conducted at the population level to identify HIV-specific CD4 T cell responses to individual HIV protein subunits and peptides and to elucidate the immunodominance profile of these responses in a large cohort of HIV controllers and progressors. Our results demonstrate that the breadth of total HIV-specific CD4 T cell responses and, also, the breadth and magnitude of Gag-specific responses are inversely correlated with viral load. Furthermore, differences exist in the patterns of immunodominant peptide targeting of subjects with differing clinical outcomes. Dominant targeting of Gag was exhibited by HIV controllers, while HIV progressors frequently targeted Env epitopes that have previously been underestimated in chronic infection. Indeed, the ratio of Gag/Env responses was a strong marker of viral control. In addition, three distinct Gag peptides were identified that linked to spontaneous HIV control. Together, these data are consistent with our hypothesis that HIV-specific CD4 T cells are likely to make an important contribution to the durable control of HIV replication.

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Effects of HIV on metabolic and biological pathways of CD4+ T lymphocytes

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Abstract. The effects of human immunodeficiency virus (HIV) on the metabolic and biological pathways of cluster of differentiation (CD)4+ T lymphocytes were investigated. A total of 150 patients with acquired immune deficiency syndrome (AIDS) and 50 healthy individuals who were admitted to hospital for physical examination during the period of June 2016 to January 2017, were selected as subjects in the present study. According to the virus load, 150 AIDS patients were divided into three groups: i) Viral load $>10^5$ copies/ml (group A, n=39), ii) 10^4 copies/ml < viral load $<10^5$ copies/ml (group B, n=76), and iii) viral load $<10^4$ copies/ml (group C, n=35). The relationship between viral loads in the three groups and CD4+ T lymphocyte counts was assessed. Active lymphocytes were isolated from T lymphocytes in the subjects, and the ratio of Th1 to Th2 was measured by flow cytometry. Effects of HIV on human T-lymphocyte differentiation were observed. Differences in T-lymphocyte metabolites were detected by proton nuclear magnetic resonance and their biological pathways analyzed. The results showed that CD4+ T-cell counts were decreased with the increase of the viral loads of patients. The viral loads of AIDS patients differentiated T lymphocytes. In other words, high viral loads accelerated the differentiation of T lymphocytes into Th1 cells. In the high HIV viral load group, the levels of glycerol phosphodiesterase, 7-dehydrocholesterol, p-hydroxyphenylacetic acid, cholesterol and deoxyuridine were increased, but the levels of 3-methoxytyramine, cytidine deaminase, deoxycorticosterone and 3-hydroxybutyric acid were decreased. The viral loads of AIDS patients are associated with CD4+ T-cell counts and the ratio of CD4+ T to CD8+ T cells. At the same time, HIV viral loads can affect the lipid biosynthesis of T-lymphocyte membranes, thus affecting the differentiation and proliferation of T lymphocytes and finally intervening its mediated immune responses.

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Key words: viral load, acquired immune deficiency syndrome, human immunodeficiency virus, CD4+ T lymphocytes

Introduction

Acquired immune deficiency syndrome (AIDS) is a type of acquired immune deficiency syndrome caused by human immunodeficiency virus (HIV) infection. The number of AIDS patients has been on the increase annually (1). The main transmission modes of the disease include sexual, blood and mother-to-fetus transmission.

At present, the main diagnosis of AIDS is based on laboratory tests. The number of peripheral blood cluster of differentiation (CD)4+ T lymphocytes and viral load can be used as important test indicators to assess the severity of AIDS patients, determine the progression of the disease and evaluate the prognosis of AIDS patients following antiviral therapy (2). The CD4+ T lymphocyte is one of the central cells involved in immune responses *in vivo*. HIV mainly infects CD4+ T lymphocytes. T lymphocytes in healthy individuals contain approximately 65% of CD4+ T lymphocytes and 35% of CD8+ T lymphocytes (3,4). Once HIV infection occurs, the body's immune system is damaged resulting in decreased CD4+ T lymphocyte and dysfunction as well as increased CD8+ T lymphocyte levels, eventually leading to CD4+/CD8+ imbalance. Therefore, the main assessment indicator is immune system damage condition in AIDS patients. In other words, the CD4+ T lymphocyte expression level is used to determine whether the immune cell function is disordered (5-7). The detection of viral load in the peripheral blood of patients is the most important factor affecting the progress of AIDS (8).

Therefore, in the present study, we analyzed the relationship of viral loads with CD4+ T-cell counts, T lymphocyte differentiation and metabolites in AIDS subjects. The aim of the present study was to provide a theoretical basis for conducting antiviral therapies as early as possible to reduce the incidence and death rate of AIDS.

Materials and methods

General materials. A total of 150 AIDS patients admitted to Qingdao Sixth People's Hospital (Shandong, China) from June

HUBUNGAN ANTARA STADIUM KLINIS, *VIRAL LOAD* DAN JUMLAH CD4 PADA PASIEN *HUMAN IMMUNODEFICIENCY VIRUS* (HIV)/*ACQUIRED IMMUNO DEFICIENCY SYNDROME* (AIDS) DI RSUP DR. KARIADI SEMARANG

Elizabeth Fajar P.P[1], Muchlis A.U Sofro[2]

ABSTRAK

Latar Belakang : AIDS adalah sindroma penyakit defisiensi imunitas yang didapat karena HIV merusak kekebalan tubuh yaitu CD4. HIV/AIDS menjadi masalah kesehatan global

Tujuan : Mengetahui hubungan antara stadium klinis, *viral load* dan jumlah CD4 pada pasien HIV/AIDS di RSUP Dr. Kariadi Semarang

Metode : Penelitian ini menggunakan observasional analitik, desain *Cross – Sectional*. Catatan medik sebagai sample penelitian.Uji statistik yang digunakan *Chi – Square*

Hasil : Dari 86 sample dilakukan test *viral load* (VL) : VL terdeteksi dengan CD4 ≤ 200 : 18 (66,7%) ; > 200 : 9 (33,3%) , VL tidak terdeteksi dengan CD4 ≤ 200 : 28 (47,5%) ; > 200 : 31 (52,5%). Pasien meninggal dengan VL terdeteksi dan CD4 ≤ 200 : 8 (44,4%) ; > 200 : 1 (11,1%). Pasien hidup dengan VL terdeteksi dan CD4 ≤ 200 : 10 (55,6%) ; > 200 : 8 (88,9%). Pasien meninggal dengan VL tak terdeteksi dan CD4 ≤ 200 : 9 (32,1%) ; > 200 : 3 (9,7%). Pasien hidup dengan VL tak terdeteksi dan CD4 ≤ 200 : 19 (67,9%) ; > 200: 28 (90,3%). Stadium klinis ringan dengan VL terdeteksi: 5 (41,7%) ; VL tak terdeteksi : 7 (58,3%). Stadium klinis berat dengan VL terdeteksi : 22 (29,7%) ; VL tak terdeteksi : 52 (70,3%). Stadium klinis ringan dengan CD4 ≤ 200 : 2 (16,7%) ; > 200 : 10 (83,3%). Stadium klinis berat dengan CD4 ≤ 200 : 44 (59,5%) ; > 200 : 30 (40,5%). Stadium klinis berhubungan dengan jumlah CD4 (p=0,017) artinya pada stadium klinis ringan, jumlah CD4 tinggi & sebaliknya. Stadium klinis dengan *viral load* & jumlah CD4 dengan *viral load* tidak berhubungan.

Kesimpulan : Hasil penelitian ini ada hubungan antara stadium klinis dengan jumlah CD4 & tidak ada hubungan antara stadium klinis dengan *viral load* serta jumlah CD4 dengan *viral load* pada pasien HIV/AIDS.

Kata kunci : Stadium klinis, *viral load*, jumlah CD4, HIV/AIDS

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SSPH+

ORIGINAL ARTICLE

Effects of an HIV-Care-Program on immunological parameters in HIV-positive patients in Yaoundé, Cameroon: a cluster-randomized trial

Germaine N. Nkengfack · Judith N. Torimiro · Jeanne Ngogang · Sylvia Binting · Stephanie Roll · Peter Tinnemann · Heike Englert

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Abstract

Objectives To measure the effects of an HIV-Care-Program, focusing on nutrition and lifestyle, which can be provided at scale to HIV-infected patients, on clinical and anthropometrical parameters, and health status.

Methods A cluster-randomized trial, including 5 health facilities randomized to intervention $n = 100$ (HIV-Care-Program) or control $n = 101$ (Usual-Care). The HIV-Care-Program consisted of counseling lessons for 6 months, on: nutrition, hygiene, coping with stigma and discrimination, embedded in practical activities. Outcome variables were CD4 count after 6 months and time to antiretroviral therapy (ARV) initiation, using analysis of covariance and Kaplan–Meier method, respectively.

Results After 6 months, CD4 count dropped by 46.3 cells (7.7 %) (intervention) and 129 (23 %) (control) ($p = 0.003$). Mean time to ARV; 5.9 months 95 % CI (5.9, 6.0) (intervention); 4.9 months 95 % CI (4.7, 5.2) (control) ($p < 0.004$). There was a partial correlation between CD4 count and initial viral load ($r = -0.190$, $p = 0.017$).

Conclusions The intervention provides a low-cost alternative improving health status, slowing down CD4 cell decline, delaying initiation of ARV and thus freeing local ARV capacities for patients in urgent need.

Keywords HIV · Nutrition · Counseling · Lifestyle · Cluster randomization

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Introduction

The global HIV epidemic continues to pose one of the severest clinical and public health problems for large number of people in Africa. Out of the 34 million people living with HIV worldwide, 69 % come from sub-Sahara African countries alone (UNAIDS 2011).

Significant research efforts are ongoing to reduce the burden of HIV infection on individual persons and populations. These include: improving antiretroviral therapy and highly active antiretroviral therapy (ARV/HAARTS), or measuring supportive interventions such as nutrition optimization. ARV/HAARTS are known to suppress the viral replication and improve CD4 counts (Isanaka et al. 2012). However, ARV/HAARTS availability is still limited in sub-Sahara African settings and its use is associated with side effects including changes in distribution of body fat, insulin resistance, fatigue etc. Due to these side effects, patient's adherence to treatment has greatly been limited, thus leading to drug resistance (Ngondi et al. 2006; DaCosta DiBonaventura et al. 2012).

Meanwhile, there is increasing agreement that nutrition plays a vital role in the care and management of HIV and is fundamentally linked to immune system functions. HIV

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IMMUNOLOGICAL PROFILES IN HIV POSITIVE PATIENTS FOLLOWING HAART INITIATION IN KIGALI, RWANDA
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IMMUNOLOGICAL PROFILES IN HIV POSITIVE PATIENTS FOLLOWING HAART INITIATION IN KIGALI, RWANDA

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ABSTRACT

Background: **Interleukin-10, IL-2 and IFN-γ are some of the crucial cytokines associated with HIV infection and pathogenesis. While IL-2 and IFN-γ play critical roles in host resistance to infection, IL-10 inhibits the synthesis IFN-γ, IL-2 at mRNA and protein level; exacerbating damage to immune system.**

Objective: **To determine the levels of, changes in and correlation between CD4 count, viral load, IL-10, IL-2 and IFN-γ before HAART and at six months of HAART among HIV positive patients in Kigali; with a view to understand cytokine networks particularly in relation to HAART ; and to see whether they can be used as alternative markers of the disease progression.**

Design: **Longitudinal study.**

Setting: **Kagugu, Kimironko, Biryogo, Gitega Health Centres and Centre Medico-Social Cornum; all located in Kigali.**

Subjects: **Thirty three (33) HAART initiation eligible HIV positive patients including 13 women and 20 men.**

Results: **A drop in viral load (though only a small number of patients achieved an undetectable viraemia); a recovery of CD4+ cells, a decrease in IL-10 (though it remained high for many patients especially those with unchanged viraemia); and an increase in IL-2 and IFN-γ indicated a successful HAART . A negative correlation between CD4 count and viral load and between CD4 count and IL-10 (but $r < -0.5$) was observed. IL-10 correlated positively and strongly with viremia ($r > 0.5$ at both time points: p-values < 0.05). There was no significant correlation between CD4 count, IL-2 and IFN-γ.**

Conclusion: **Results demonstrated the down-regulatory effect of IL-10 on Th1 cytokines and that a shift from Th1 to Th2 cytokine is associated with HIV disease progression. A successful HAART results in CD4+ cells recovery, drop in viraemia and IL-10 with up-regulation of Th1 cytokines. Also, findings show potential usefulness of IL-10 as a marker of HIV disease progression.**

INTRODUCTION

Global statistics from UNAIDS indicate that nearly 35 million people are currently infected with human immunodeficiency virus (HIV), the causative agent of acquired immunodeficiency syndrome (AIDS). About two million people are infected each year, while 25 million people have died from HIV / AIDS since the disease was first identified in the early 1980s (1).

Human Immunodeficiency Virus is a lentivirus belonging to the retroviridae family and is classified into two types, HIV-1 and HIV-2. HIV-1 comprises of groups M (major), N (non-M non-O), and O (outlier). Due to a high level of genetic diversity, group M is further sub-classified into subtypes (A to D; F to H; J, and circulating recombinant forms). While HIV-2 remains essentially confined to West Africa, HIV-1 spreads around the world; with group M accounting for the vast majority of HIV infections (2,3).

Currently, viral load and CD4 count are the only markers employed for HIV disease progression assessment (4). Though less expensive compared to viral load, CD4 cells count does not always correlate with the viral load and disease progression and

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Special Article

EVIDENCE FOR LOWER CD4+ T CELL AND HIGHER VIRAL LOAD IN ASYMPTOMATIC HIV-1 INFECTED INDIVIDUALS OF INDIA: IMPLICATIONS FOR THERAPY INITIATION

***R Kannangai, AJ Kandathil, DL Ebenezer, G Nithyanandam, P Samuel, OC Abraham, TD Sudarsanam, SA Pulimood, G Sridharan**

Abstract

Purpose: We have earlier documented that the south Indian population had lower CD4 counts. The aim of this study was to investigate a previous suggestion on a new CD4+ T cell cut off and association with HIV-1 RNA levels for decision on anti retroviral therapy in India (south). **Methods:** We evaluated a new methodology i.e., artus real-time PCR and CD4+ T cell count by Guava EasyCD4™ system. From 146 HIV infected individuals seen at a tertiary care centre, blood was collected for CD4+ T cell and HIV-1 RNA estimation. **Results:** The receiver operating characteristic curve cut off value for the CD4 counts to distinguish between CDC clinical categories A and B was 243 cells/μL, and to distinguish B and C was 153 cells/μL. The RNA level that differentiated CDC A and B was 327473 RNA copies/mL, while for CDC B and C was 688543 copies/mL. There was a significant negative correlation ($r = -0.55$, $P < 0.01$) between the RNA estimated and CD4+ T cell counts in HIV infected individuals. **Conclusions:** A majority with CD4 counts of 201-350 cells/μL in our population had higher viral load than the treatment threshold suggested by the International AIDS society and the above two methodologies are useful in monitoring HIV infections.

Key words: *Artus HIV-1 real-time PCR, Gauva easyCD4 assay, HIV, India*

A report from this centre had earlier shown that the south Indian population had lower CD4 T cells counts and hence requires a different cut off for clinical classification for HIV infected individuals. Anti retroviral therapy (ART) for human immunodeficiency virus disease is currently available even in countries with resource poor settings.[1] At present most of the attention is also focused at low cost methods for the estimation of CD4+ T cell counts and viral load for the monitoring of infection.[2-3] There are different CD4+ T cell estimation assays that have been evaluated with the standard technique of flow cytometry.[2-4] Recently we have evaluated the Guava EasyCD4™ system (Guava Technologies, Hayward, CA, USA) for the T cell estimation with flow cytometry.[5] The aim of this study was to investigate further the previous suggestion on new CD4+ T cell and HIV-1 viral loads for initiating ART in India (south). In this study we applied the presently available commercial assays for viral load estimation (Qiagen artus real-time PCR assay,GmbH, Germany) and the CD4 cell count (Guava EasyCD4™ system, CA, USA) in HIV-1 infected individuals to find evidence for proposed cut offs.

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Materials and Methods

Blood samples was collected from 146 serologically identified HIV infected treatment naïve individuals who came to the clinical virology department of a tertiary care centre in India (south) for monitoring tests. The samples were collected always between 8:00 am and 10:00 am during the period of March 2005 through September 2006 after an informed consent. The individuals were classified into CDC clinical categories: asymptomatic (A), symptomatic (B) and AIDS (C) by the appropriately trained examining physician. Category C differed from B in having AIDS-defining illnesses like disseminated or extra pulmonary tuberculosis, cryptococcal meningitis, oesophageal candidiasis, chronic diarrhoea with wasting syndrome. In addition, stratification based on CD4+ T cell counts into three categories as per CDC guidelines was carried out for analysis. The categories were individuals with CD4+ T cell count ≥ 500 (category 1), 200 - 499 (category 2) and <200 (category 3).

Absolute CD4+ T cell counts were estimated by the Guava EasyCD4™ System (Guava Technologies, Hayward, CA, USA) as reported earlier.[5] The CD4 evaluation in our laboratory by this instrument is a part of a regular external quality assurance program carried out by WHO and a laboratory in Thailand under the auspices of NACO, India. The HIV-1 viral load was estimated using real-time PCR, RotorGene 3000 (Corbet Research Scientific, Australia) with artus HIV-1 RG RT-PCR assay (Qiagen GmbH, Germany). The manufacturer's instructions were followed for the extraction of RNA and for the reverse transcriptase PCR.

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Hindawi

Research Article

Virological and Immunological Status of the People Living with HIV/AIDS Undergoing ART Treatment in Nepal

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Antiretroviral therapy (ART) has increased the life span of the people living with HIV (PLHIV), but their virological and immunological outcomes are not well documented in Nepal. The study was conducted at a tertiary care center including 826 HIV-1 seropositive individuals undergoing ART for at least six months. Plasma viral load (HIV-1 RNA) was detected by Real Time PCR and $CD4^+$ T-lymphocyte ($CD4^+$) counts were estimated by flow cytometry. The mean $CD4^+$ count of patients was 501 (95% CI = 325–579) cells/cumm, but about 35% of patients had $CD4^+$ T cell counts below 350 cells/cumm. With increasing age, average $CD4^+$ count was found to be decreasing ($p = 0.005$). Of the total cases, 82 (9.92%) were found to have virological failure (viral load: >1000 copies/ml). Tenofovir/Lamivudine/Efavirenz (TDF/3TC/EFV), the frequently used ART regimen in Nepal, showed virological failure in 11.34% and immunological failure in 37.17% of patients. Virological failure rate was higher among children < 15 years (14.5%) ($p = 0.03$); however, no association was observed between ART outcomes and gender or route of transmission. The study suggests there are still some chances of virological and immunological failures despite the success of highly active ART (HAART).

1. Background

The epidemic of human immunodeficiency virus type I (HIV-1) in Nepal is dynamic and concentrated among key populations at higher risk like people who inject drug (PWID), men who have sex with men (MSM) and transgender people, sex workers (SW), and male labor migrants [1]. In 2015, estimated HIV prevalence was 0.2% with estimated cases and reported cases being 39,249 and 26,702, respectively [2]; however, the prevalence data of HIV drug resistance has not yet been available in Nepal. According to recent data, 11089 people living with HIV (PLHIV) were on ART. Of them, 8003 were on regular first-line regimens, 2944 on substituted first-line regimens, and 142 on second-line regimens. Until July of 2015, 2089 cases of AIDS related death have been reported [2].

The primary goal of ART is to suppress HIV-1 RNA lower than the detection level (LDL) of the assay within six months on treatment and restore immunologic function, to reduce morbidity and mortality, to reduce vertical transmission, and to improve overall quality of life [3]. However, there are still unresolved problems including early mortality, incomplete responses, variations in ART outcomes, lack of universal consensus to define treatment failures and time to start ART, drug resistance, and loss to follow-ups [4]. Though HIV-1 RNA testing is the gold standard to monitor patients on ART, due to costs and technical demands needed for it, $CD4^+$ T cell measurements are recommended for resource-poor settings [5]. Due to the lack of HIV-1 RNA monitoring in resource-poor settings, patients from these areas are supposed to continue on first-line ART until virological failure progresses to a 50% decrease in $CD4^+$ T cell count (immunologic failure) or the recurrence of symptomatic HIV disease (clinical failure). Even then, clinicians may delay switching to second-line therapy, due to the limited availability of second-line medications and the poor specificity of $CD4^+$ T cell counts and clinical symptoms for predicting virological failure [6].

Plasma HIV-1 RNA (viral load) testing quantifies the HIV viral burden in the plasma. The viral load is a standard tool

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Title: Is there an association between viral load, CD4 count, WHO staging & dental caries in HIV-positive children?

Abstract

Background: Few studies have investigated an association between CD4 counts, viral load (VL), WHO staging and caries among HIV-positive (HIV+) children on HAART therapy (> 12 months).

Aim: To determine the strength of association between CD4 counts, WHO staging, VL and dental caries.

Design: This cross sectional analytical study comprised of 355 HIV+ children, aged of 4-12 years, attending a hospital in Johannesburg, South Africa. Demographic & clinical data such as decayed (d,D), missing (m,M) , filled teeth (f,F) [dmft/DMFT], CD4 counts and WHO staging were collected. Correlation and Regression analyses were done to test for associations.

Results: Caries prevalence for this cohort of children was 57%. The dmft scores for the primary dentition was 4.36 (SD 4.87) and DMFT for secondary dentition was 0.58 (SD 1.49). Pearson Correlation analyses showed significant association between VL and CD4 count (p=0.003) and VL and WHO stage (p=0.007). Weak associations were noted between Caries (d, D) and VL, CD4 count and WHO stage of disease for correlation and regression analyses.

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Original Research Article.

Correlation between CD4 Count and HIV-1 Viral Load among ART Naive Patients Attending ICTC, SMS Medical College, Jaipur

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ABSTRACT

Objectives: To study the correlation between CD4 count & HIV-1 viral load among ART Naive patients attending ICTC SMS Medical College, Jaipur.

Material and Methods: This study was conducted on 250 HIV serologically confirmed, ART Naive cases from ICTC, SMS Jaipur. RNA extraction was done from plasma samples by Qiagen Viral RNA Mini Kit then HIV-1 Viral load was determined by Qiagen HIV-1 viral load kit on ABI 7500 Fast dx Real Time PCR, while CD4 count was done on FACS CALIBUR flowcytometer (BD Biosciences). SPSS ver. 21.0 was used to determine correlation between CD4 count & HIV-1 viral load.

Results: Out of 250, 216 (86.4%) cases were found in which viral RNA was detected. These samples were correlated with their CD4 Count. The mean of viral load was 194746.2791 ± 550442.61805 IU/ml while CD4 count was 282.7674 ± 217.56456 cells/ul. Females were having Avg. Viral load 228506.7273 & CD4 count 337.21 and males were found to have Avg. Viral load 179791.9866 & CD4 count 258.65

Conclusion: This study concluded a negative correlation between HIV-1 RNA viral load and CD4 count in HIV-seropositive ART naïve patients of this part of the country. Our study confirmed that HIV-1 RNA viral load levels are significantly higher in women than in men, but no such significant gender difference in the CD4 count was found.

Keywords: ART Naive HIV, HIV-1 RNA Viral Load, CD4 Count.

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INTRODUCTION

HIV is a major global public health issue. In 2018, 37.9 million people globally were living with HIV. HIV epidemic in India is slowing down as new infections have decreased 27% from 2010 to 2017. India contributes third highest burden of HIV pandemic worldwide, with 2.1 million people infected with HIV. Out of these 79% cases are aware about their HIV status. 56% are on antiretroviral treatment (ART). Very few studies have yet reported HIV-1 RNA Viral load in ART Naive patients.[1]

HIV-1 RNA viral load is generally used as a marker to progression of the disease. CD4 counts being a simpler test helps to start the ART therapy in HIV positive individuals. In a symptomatic HIV1 infected individual, there is low CD4 count and high HIV-1 RNA viral load.[2,3] However some individuals with a high CD4 count may have a high HIV-1 RNA viral load.[4] This study was planned to find the baseline HIV-1 RNA Viral Load and its correlation with baseline CD4 count in newly diagnosed HIV seropositive ART naïve patients attending ICTC SMS, Jaipur.

AIMS AND OBJECTIVES

To correlate CD4 Count with HIV-1 RNA Viral load in ART Naive Patients.

MATERIALS AND METHODS

Study Center: 250 HIV-1-infected, who were not on ART, were enrolled for this study between 2014-19.

Inclusion Criteria: Newly diagnosed HIV seropositive cases who had not started ART were included in this study

Exclusion Criteria: On ART patients were excluded.

Permission and Ethical Consideration: Permission for this study was obtained from the Institutional Ethics Committee.

Short Communication

Simple markers for the detection of severe immunosuppression in children with HIV infection in highly resource-scarce settings: experience from the Democratic Republic of Congo

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Objectives: The decision to initiate the antiretroviral therapy in HIV-infected children living in poor countries is compromised by lack of resources. The objective of this study is to identify simple clinical and biological markers other than CD4+ count and viral load measurement that could help the decision to introduce antiretroviral treatment and to monitor patients.

Methods: A cross sectional study was conducted between January and March 2005 in Kinshasa, Democratic Republic of Congo.

Results: Eighty-four children infected with HIV were recruited. In this cohort, the lymphocytes (P=0.001) and CD4 (P=0.0001) were significantly lower in children with immunological stage 3 and viral load (P=0.027) was significantly higher in children at the same immunological stage. Reticulocytes (r=+0.440), white blood cells count (r=+0.560), total lymphocytes (r=+0.675) and albumin (r=+0.381) showed positive significant correlations with CD4. Haemoglobin (r=−0.372), Haematocrit (r=−0.248), red blood cells (r=−0.278) and CD4 (r=−0.285) showed negative significant correlations with viral load. Neutropaenia (P=0.02), enlarged nodes (P=0.005) and oral candidiasis (P=0.04) were associated with viral load >10 000 copies/ml. Oral candidiasis (P=0.02) was associated with CD4 level <15%.

Conclusion: Oral candidiasis, enlarged nodes, total lymphocytes count, neutropaenia and albumin predict severe immunodepression. These clinical and biological markers may guide the clinician in making the decision to initiate antiretroviral therapy in highly resource-scarce settings.

Keywords: HIV, Children, Simple markers, CD4, Viral load, Antiretroviral therapy, Highly resource-scarce settings, Kinshasa, The Democratic Republic of Congo, Africa

Introduction

Human Immunodeficiency Virus (HIV)/Acquired immune deficiency syndrome (AIDS) is one of the most devastating diseases worldwide. UNAIDS in their 2013 report state that Sub-Saharan Africa contributes significantly to the high global rate of

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BRIEF REPORT

Detection of HIV-1 viral load in tears of HIV/AIDS patients

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Abstract

Objectives The tear, as an important bodily secretion, plays a crucial role in preventing infection and maintaining homeostasis of ocular surfaces. Although accumulating studies have reported on the HIV-1 viral load profile among varying bodily fluids and secretions, little was known concerning HIV-1 dynamics in tears. Therefore, the objectives of this study were to investigate the HIV-1 viral load in tears of HIV/AIDS patients and study factors influencing their tear viral load.

Methods A cross-sectional study was conducted. 67 patients with a confirmed HIV-1 infection or AIDS were recruited from the Beijing You'an Hospital, China between April 2018 and September 2018. Socio-demographic information and laboratory test results were collected. At the same time, ophthalmic examinations were carried out and tear samples were tested.

Results Of 30 highly active antiretroviral therapy (HAART)-naïve patients, 53.3% had detectable HIV-1 RNA in tears. Of 37 patients on HAART, HIV-1 RNA was undetectable in their tears, regardless of treatment duration and blood viral load. Tear viral load ranged from TND (target not detected) to 13,096 copies/mL. Viral load was lower in tears than in blood plasma ($p < 0.001$), and was significantly correlated with plasma viral load (Rho = 0.566, $p < 0.001$) and AIDS stage (Rho = 0.312, $p = 0.01$), but negatively correlated with $CD4^+$ T cell count, $CD4^+/CD8^+$ T cell count, and duration of HIV infection (Rho = -0.450, Rho = − 0.464, Rho = − 0.565; $p < 0.001$).

Conclusions HIV-1 RNA is present in tears of more than half of the HAART-naïve patients, whereas absent in tears of patients on HAART. Tear viral load is positively associated with plasma viral load while it is negatively correlated with CD4 cell count. This study provides novel insights into the area with limited understanding–HIV-1 viral load in tears.

Keywords Tear · Viral load · HIV · AIDS

Background

It is widely recognized that the HIV-1 virus can penetrate into various tissues and exist in bodily fluids and secretions [1]. Accumulating studies have reported on the HIV-1 viral load profile and associated factors among varying bodily fluids, such as cerebrospinal fluid, saliva, breast milk, and semen [2, 3]. However, such data for tear, an important bodily secretion playing a crucial role in refraction, preventing infection, and maintaining homeostasis of ocular surfaces [4], remains unknown and is worth further investigation.

From the previous since three decades ago, the researcher has found that HIV-1 can be infrequently isolated from tears [5]. Also, it was hard to detect proviral sequences in tears of HIV-positive patients [6]. In 2011, HIV-1 RNA load was reported to be high in tears of patients who underwent long-term highly active antiretroviral therapy (HAART) with undetectable blood viral load, suggesting that the tear-associated tissues could be new reservoirs of HIV-1 [7]. Besides the three above reports, there are few studies regarding the HIV-1 virus in tears, and such available studies were conducted relatively early. Hence, it is essential to investigate the tear HIV-1 viral load in the era of new antiretrovirals. The objectives of this study were to measure the level of

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