

# CD4 descriptions at various clinical HIV/AIDS stages with tuberculosis and non-tuberculosis opportunistic infections at dr. Zainoel Abidin hospital in Banda Aceh, Indonesia

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**Abstract.** Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS) is a retrovirus that infects the human immune system. Damaged immunity in HIV/AIDS patients is marked by a decline in CD4 cells. Opportunistic infections appear differently, depending on the levels of immunosuppressive degrees, and the frequency of opportunistic infections in the environment. This study aims to describe the CD4 at various clinical stages of HIV/AIDS with tuberculosis and non-tuberculosis opportunistic infections (OI). Descriptive study with a cross-sectional design. This study is secondary data obtained from the medical records of patients with HIV/AIDS in the period of January 2011 - December 2015 at dr. Zainoel Abidin Hospital in Banda Aceh. The samples that met the inclusion criteria were 135 people with 63 cases were tuberculosis OI, 33 cases were non-tuberculosis and 39 cases were without OI. The study showed CD4 <200 cells/mm<sup>3</sup> was the highest level at all clinical stages (I-IV), with the prevalence of 85.7% for tuberculosis OI and 93.9% for non-tuberculosis OI.

## 1. Introduction

Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS) is a retrovirus that infects several types of white blood cells, especially CD4 and monocyte/macrophage cells, causing a decline in the immune system. AIDS is a collection of symptoms of the disease caused by HIV infection.[1-4]

According to the World Health Organization (WHO) in its report on November 2015, 36.9 million of people were living with HIV infection, and 2 million of them were newly infected. WHO also reported 1.2 million of people died during 2014.[2] Meanwhile in Indonesia, based on the data released by the Ministry of Health of the Republic of Indonesia in 2014 it was found out 32,711 cases of HIV/AIDS. More than 440 HIV cases were present in 15 provinces and accounted for 90% of all HIV cases in Indonesia. Provinces with the highest HIV rates were the Special Capital Region of Jakarta, East Java, and West Java. Meanwhile, Aceh together with North Maluku, Gorontalo, and West Sulawesi were the least HIV affected provinces with the number of cases less than 90.[5]



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WHO classifies HIV stages based on the clinical findings that combined diagnosis, evaluation, and management of HIV/AIDS, and does not consider CD4 cell count. The clinical stages are stage I, stage II, stage III and stage IV.[6] Immunologic damage on HIV/AIDS patients can be marked by looking at the patient's CD4 levels. CD4 is a marker present in human white blood cells, especially in the lymphocytes. This cell serves to combat infections that enter the body. The CD4 examination is performed to assess the immunity status of HIV patients and to identify patients who require opportunistic infection prophylactic treatments and antiretroviral therapy.[7,8]

Opportunistic infections (OI) are the leading cause of death in people with AIDS with a percentage of 90%. Several factors that affect the occurrence of OI in HIV/AIDS patients are nutritional status, CD4+ T-cell count, transmission risk factors, sex and age group.[9] In Indonesia, a study of 698 cases at Dr.CiptoMangunkusumo conducted by Merati and Djauzi, found that the most common opportunistic infection was oral candidiasis (40%), followed by tuberculosis (37.1%), chronic diarrhea (27.1%), bacterial pneumonia (16.7%), cerebral toxoplasmosis (12%) and *Herpes zoster* infection (6%).[10]

HIV has become the cause of tuberculosis (TB) development. This is because people with HIV are not able to combat the disease, unlike TB uninfected people. In tuberculosis suspected patients, HIV testing is recommended at the same time an initial sputum sample is sent for microscopy examination. In patients who have already been diagnosed with TB are also recommended to do HIV testing, and initiate TB treatment. Globally, 30% of the HIV patients are estimated to be infected with *M. tuberculosis*, this percentage varies, 14% in Europe and 46% in Southeast Asia.[11,12]

In non-TB HIV cases, oral candidiasis is the most common opportunistic infection that occurs in the world, 19% of new HIV sufferers who have not received antiretroviral therapy.[13] The oral candidiasis occurrence in HIV/AIDS patients is caused by several factors such as *Candida* species virulence and CD4 cell levels decline. In Indonesia, it has been found out that *C.albicans* is the most common attacking *Candida* species with the percentage of 88% based on the research conducted by Walangare et al. In Dr.Saiful Anwar Malang Hospital.[14] Meanwhile, the percentage based on the research conducted by Rasdiana in Dr. WahidinSudirohusodo is 50%.[15]

Based on the description above, the researcher wanted to conduct a study regarding CD4 descriptions at various clinical stages of HIV/AIDS with and without TB opportunistic infections at dr. Zainoel Abidin Hospital in Banda Aceh.

## 2. Methods

This study is a descriptive study done by using a cross-sectional method, by using medical records data. The study was conducted at HIV/AIDS Voluntary Counseling and Testing (VCT) Clinic at dr. Zainoel Abidin Hospital in Banda Aceh on 27<sup>th</sup> October 2016 to 25<sup>th</sup> November 2016. The population of this study is the medical records of 141 HIV/AIDS patients who underwent outpatient and inpatient treatments at dr. Zainoel Abidin Hospital since 1<sup>st</sup> January 2011 – 31<sup>st</sup> December 2015.

The sampling of each subject was done by using the Non Probability Sampling technique with the total sampling method. Total sampling is a sampling method in which the sample size equals to population size.

Sample criteria of this study, the inclusion criteria were all of the medical records of patients diagnosed with HIV/AIDS at HIV/AIDS VCT clinic at dr. Zainoel Abidin Hospital and the exclusion criteria of this study were the medical records of HIV/AIDS patients with incomplete data such as there is no CD4 cell count, clinical stage, type of opportunistic infection and common identities such as age and sex and HIV/AIDS patients > 18 years.

## 3. Results

The data collection was conducted from 27<sup>th</sup> October to 25<sup>th</sup> November 2016 at dr. Zainoel Abidin Hospital in Banda Aceh. From the results obtained, there were 141 cases with six missing value cases the exclusion criteria and there were 135 cases, the inclusion criteria. There were 18 out of 135 samples who died.

**Table 1.** Distribution of HIV/AIDS patients based on the gender and age against the incidences of TB and Non-TB opportunistic infections.

		Frequency		Opportunistic Infection					
				TB		Non-TB		No OI	
		n	%	n	%	n	%	n	%
<b>Gender</b>	<i>Males</i>	95	70.4	47	74.6	26	78.8	22	56.4
	<i>Females</i>	40	29.6	16	34.8	7	21.2	17	43.6
<b>Total</b>		<b>135</b>	<b>100</b>	<b>63</b>	<b>46.7</b>	<b>33</b>	<b>24.4</b>	<b>39</b>	<b>28.9</b>
<b>Age</b>	18-25	19	14.1	8	12.7	2	6.1	9	14.1
	26-35	73	54.1	32	50.8	21	63.6	20	54.1
	36-45	29	21.5	16	25.4	8	24.2	5	21.5
	46-55	13	9.6	7	11.1	2	6.1	4	9.6
	56-65	1	0.7	0	0	0	0	1	2.6
	<b>Total</b>	<b>135</b>	<b>100</b>	<b>63</b>	<b>46.7</b>	<b>33</b>	<b>24.4</b>	<b>39</b>	<b>28.9</b>

**Table 2.** Distribution of HIV/AIDS patients based on the CD4 levels against the incidences of TB and Non-TB opportunistic infections.

		Frequency		Opportunistic Infection					
				TB		Non-TB		No OI	
		n	%	n	%	n	%	N	%
<b>CD4 Level</b> (cells/mm <sup>3</sup> )	<200	102	75.6	54	85.7	31	93.9	17	43.6
	200-349	16	11.9	6	9.5	2	6.1	8	20.5
	350-499	9	6.7	2	3.2	0	0	7	17.9
	≥500	8	5.9	1	1.6	0	0	7	17.9
<b>Total</b>		<b>135</b>	<b>100</b>	<b>63</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>39</b>	<b>100</b>

**Table 3.** Distribution of HIV/AIDS patients based on the clinical stages against the incidences of TB and Non-TB opportunistic infections.

		Frequency		Opportunistic Infection					
				TB		Non-TB		No OI	
		n	%	n	%	N	%	n	%
<b>Clinical Stage</b>	I	24	17.8	0	0	0	0	24	61.5
	II	18	13.3	4	6.3	2	6.1	12	30.8
	III	51	37.8	30	47.6	19	57.6	2	5.1
	IV	42	31.1	29	46.0	12	36.4	1	2.6
<b>Total</b>		<b>135</b>	<b>100</b>	<b>63</b>	<b>100</b>	<b>33</b>	<b>100</b>	<b>39</b>	<b>100</b>

**Table 4.** Distribution of HIV/AIDS patients based on the clinical stages against the CD4 levels.

		Frequency		CD4 Level (cells/mm <sup>3</sup> )							
				<200		200-349		350-499		≥ 500	
		n	%	n	%	n	%	n	%	n	%
<b>Clinical Stage</b>	I	24	17.8	8	7.8	4	25	5	55.6	7	87.5
	II	18	13.3	10	9.8	4	25	3	33.3	1	12.5
	III	51	37.8	46	45.1	5	31.3	0	0	0	0
	IV	42	31.1	38	37.3	3	18.8	1	11.1	0	0
<b>Total</b>		<b>135</b>	<b>100</b>	<b>102</b>	<b>100</b>	<b>16</b>	<b>100</b>	<b>9</b>	<b>100</b>	<b>8</b>	<b>100</b>

#### 4. Discussion

From the results of this study conducted at Combined Polyclinic II VCT clinic dr. Zainoel Abidin Hospital found that HIV/AIDS cases with the productive age (26-35 years) were the most dominant cases, with the number of cases being 73 (54.1%). This age group is particularly vulnerable to HIV/AIDS risk factors such as promiscuity and drugs injecting behaviors. This is by the research conducted by Afrita that 90.7% of HIV/AIDS cases at dr. CiptoMangunkusomo National Central Public Hospital Jakarta was in the productive ages (25-49 years old).[16] This also correlates with the results released by the Ministry of Health of the Republic of Indonesia the percentage of the most cases occurred in the age group of 20-29 years was 31.8%, meanwhile for the age group of 30-39 years was 29.9%.[17]

Cases of HIV/AIDS with male dominated was 95 cases (70.4%). This is in correlation with the results from the Ministry of Health of the Republic of Indonesia which stated 55% of cases occurred in men.[17] The risk of men catching HIV infection is higher than women due to their negative behaviors such as using commercial sex services, and injecting drugs, having high mobility and being far away from spouses.[18]

The incidences of both TB and Non-TB opportunistic infections were dominated by males, 74.6% and 78.8%, respectively. However, this is not by the research conducted by Hardiko et al. in Wonosobo resulted that the most dominant cases of TB opportunistic infections occurred in females 66.6%.[19]

Based on the results of the study conducted at VCT Clinic at dr. Zainoel Abidin Hospital in Banda Aceh the researcher found that the numbers of HIV/AIDS sufferers in 2013 and 2014 were the most dominant 37 cases (27.4%), then the number of HIV/AIDS sufferers slightly decreased in 2015 with the total number was about 36 people or 26.7 %. This is by the results of the Ministry of Health of the Republic of Indonesia that in 2013 the number of HIV/AIDS cases was 29,037 cases and rose in 2014 to 32,711 cases and decreased in 2015 to 30,935 cases.[17] It needs a more vigorous socialization regarding HIV/AIDS transmissions so that the new cases of HIV/AIDS can be suppressed.

The results showed that CD4 cell counts  $<200$  cells/mm<sup>3</sup> existed in 102 cases (75.6%) and the levels  $\geq 500$  cells/mm<sup>3</sup> existed in the lowest cases of 8 people (5.9%). This is in correlation to the study conducted by Widiyanti and Sandy the highest number of cases occurred in CD4 cell count  $<200$  cells/mm<sup>3</sup> with the number of cases was 38 people (40%) and the lowest number of cases occurred in CD4 cell count  $>500$  cells/mm<sup>3</sup> with the number of cases was 14 people (15%). The high number of patients with CD4  $<200$  cells/mm<sup>3</sup> is caused by the behaviors of the patients who were reluctant to do an early examination when they realized they were at the risk of HIV/AIDS infection.

In this study, the percentage of HIV/AIDS cases with CD4 cell count  $<200$  cells/mm<sup>3</sup> accompanied by TB opportunistic infections was 85.7%. This is by the study conducted by Moore et al. in Uganda that stated 84% of TB-HIV cases occurred at CD4  $<200$  cells/mm<sup>3</sup>. The percentage of cases for CD4 cell count  $<200$  cells/mm<sup>3</sup> accompanied by Non-TB opportunistic infections was 93.9%. This also corresponds to the study conducted by Moore et al. in Uganda that stated 78% of non-TB HIV/AIDS cases occurred at CD4 levels  $<200$  cells/mm<sup>3</sup>. This suggests that both TB and non-TB opportunistic infections are dominated by CD4 levels  $<200$  cells/mm<sup>3</sup>. [20]

The results of this study indicate that clinical stage III is the stage with the highest occurrence frequency 51 cases (37.8%). In this study, TB opportunistic infections were also dominant at stage III and IV with the number of 30 cases (47.6%) and 29 cases (46.0%) respectively from a total of 63 cases infected only by TB. It is also similar with the WHO guideline on WHO clinical stages and immunological conditions in which the higher the clinical stage is the more varied the opportunistic infections are.[6]

The results of the study showed that the CD4 cell count  $<200$  cells/mm<sup>3</sup> was dominant at clinical stage III with the percentage of 45.1% followed by clinical stage IV with the percentage of 37.3%. CD4  $\geq 500$  cells/mm<sup>3</sup> was dominant at clinical stage I 87.5%.

This is in correlation to a study conducted by Edathodu et al. at the King Faisal Hospital and Research Center, that CD4  $<200$  cells/mm<sup>3</sup> levels were predominant at clinical stage IV with the

number of cases was 30 (43.5%) and clinical stage III with the number of cases was 20 (30.0%) out of total 69 cases with CD4 cell count  $<200$  cells/mm<sup>3</sup>. From 76 cases with the CD4 cell count  $>350$  cells/mm<sup>3</sup>, there were 65 cases (85.5%) in stage I.[21] This suggests that lower CD4 levels occur in severe clinical stages (clinical stages III and IV) and higher CD4 levels occur in a mild clinical stage (clinical stage I).

However, in the literature study conducted by Low et al., the HIV/AIDS cases in the world were dominated by oral candidiasis. 19.1% followed by tuberculosis by 10% and herpes zoster by 9%. These slightly different results are closely related to the tropical climate in Indonesia which causes *Mycobacterium Tuberculosis* to become well developed.[13]

## 5. Conclusion

This study that has been done on 135 HIV/AIDS patients, it is concluded that:

- The highest number of CD4 levels in clinical stages (I-IV) with Non-TB opportunistic infections was CD4  $<200$  cells/mm<sup>3</sup> is higher than TB opportunistic
- Pulmonary TB is the most frequent case of TB opportunistic infections is high

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