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Predictors of improved nutritional status among HIV/AIDS patients who received antiretroviral therapy (ART) at Sanglah General Hospital Denpasar

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ABSTRACT

Background and purpose: Antiretroviral therapy (ART) is associated with improved nutritional status among HIV/AIDS patients. This study aims to examine proportion, median time, incidence rate, and predictors of improved nutritional status among HIV/AIDS patients who received ART at Sanglah General Hospital Denpasar.

Methods: A restrospective cohort study was conducted in Denpasar City. A total of 207 medical records of HIV/AIDS patients who received ART between 1st of January 2012 and 30th of June 2015 were included in the study. Kaplan Meier analysis was performed to calculate incidence rate and median time of improved nutritional status among HIV/AIDS patients. Sociodemographic characteristics and clinical variables included body mass index (BMI), body weight, haemoglobin level, CD4 count, HIV clinical stadium, ART regiments, and opportunistic infections (OIs). Data were analysed using cox proportional hazard model to identify predictors of improved nutritional status among HIV/AIDS patients.

Results: As many as 65.22% of HIV/AIDS patients who received ART experienced an improvement in their nutritional status with the incidence rate of 9.1 per 100 person months and median time of 6.1 months. Multivariate analysis showed that predictors of improved nutritional status were BMI at ART initiation (AHR=1.34; 95%CI: 1.16-1.5), HIV clinical stadium (AHR=1.45; 95%CI: 1.02-2.06), CD4 count at ART initiation (AHR=0.89; 95%CI: 0.81-0.99) and the presence of diarrhoea (AHR=1.83; 95%CI: 1.06-3.14).

Conclusions: Predictors of improved nutritional status among HIV/AIDS patients who received ART were BMI, HIV clinical stadium, CD4 count and diarrhoea.

Keywords: predictors, nutritional status, ART, HIV/AIDS, Bali

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INTRODUCTION

Following the discovery of highly active antiretroviral therapy (HAART), HIV/AIDS mortality rate decreased significantly and the quality of life of HIV/AIDS patients was improved. UNAIDS reported that between 2005 and 2014, there was a 35% decrease of HIV/AIDS mortality rate.[1] An indicator used to predict the efficacy of antiretroviral therapy (ART) is nutritional status of HIV/AIDS patients.[2-7] Studies have shown that patients' conditions prior to ART initiation were associated with nutritional status improvement during the ART period. These conditions are adequacy of nutrient intake,[3,8,9] CD4 count,[10] the presence of opportunistic infections (OIs), income level,[11] and body mass index (BMI).[12] However, other studies showed that CD4 count,[2,13] cigarette smoking, alcohol and food consumption,[13] clinical stadium,[14] and ART regimen[15] are not associated or negatively associated with nutritional status among HIV/AIDS patients who received ART. In addition, other studies also found that education level[11,16] of HIV/AIDS patients are not associated with nutritional status among HIV/AIDS patients who received ART.

Sanglah General Hospital Denpasar is a centre for ART services in Bali Province with an average new patients receiving ART is 30 patients per month. A study among 110 new HIV/AIDS patients at Sanglah General Hospital between October and December 2012 found that the median BMI was 18.4 kg/m^2 and as many as 60.9% experienced wasting syndrome.[17] This study also showed that the majority of HIV/AIDS patients who initiated ART at Sanglah Hospital were malnourished. Aim of this study is to examine median time, incidence rate, and predictors of improved nutritional status among HIV/AIDS patients who received ART at Sanglah General Hospital Denpasar.

METHODS

A retrospective cohort study using survival analysis was conducted on 207 medical records of patients who initiated ART between January 2012 and June 2015 at VCT Clinic Sanglah General Hospital Denpasar. Selection criteria included patients aged at least 18 years and malnourished with BMI of

<18.5 kg/m^2 at the ART initiation. In addition, to be included patient should have had at least one follow up visit after the ART initiation. Pregnant patients and those with incomplete medical record were excluded.

Improved nutritional status was defined as when patients reached BMI of ≥18.5 kg/m^2. All predictor variables were measured at the time of ART initiation. Those variables were sex, age, address, education level, employment, waiting time for ART, BMI, body weight, haemoglobin level, CD4 count, HIV clinical stadium, opportunistic infections and ART regiments. Median time of improved nutritional status was determined using Kaplan Meier analysis. Association between predictors and improved nutritional status was assessed using cox regression. The study protocol has been approved by Human Research Ethics Committee of Faculty of Medicine Udayana University/Sanglah General Hospital.

RESULTS

Table 1 presents the characteristics of patients. The median age for ART initiation was 32 years. As many as 55.56% of patients were male, 48.79% were senior high school graduates, 60.39% were married, 70.05% were government employees, private sectors or entrepreneur, and 55.07% were living in Denpasar or Badung. The median time of waiting time before ART was 39 days, where as many as 40.10% of patients were initiated ART in 2014.

A total of 135 patients (65.22%) reached the normal nutritional status while 52 patients (25.12%) were still malnourished. In addition, 20 patients

Table 1 Sociodemographic characteristics of HIV/AIDS patients

Characteristics	n=207	%
Age at ART initiation		
Median	32	-
IQR	12	-
Sex		
Male	115	55.56
Female	92	44.44
Education		
No school	6	2.90
Primary	42	20.29
Junior high	38	18.36
Senior high	101	48.79
Tertiary education	20	9.66
Marital Status		
Not married	82	39.61
Married	125	60.39
Employment		
Unemployed, labourer, farmer	62	29.95
Government worker, private sector, entrepreneur	145	70.05
Address		
Outside Denpasar/Badung	93	44.93
Denpasar/Badung	114	55.07
Waiting time for ART (days)		
Median	39	-
IQR	72	-
Year of ART initiation		
2012	33	15.94
2013	77	37.20
2014	83	40.10
2015	14	6.76

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Table 2 Crude hazard ratio (CHR) for predictors of improved nutritional status

Variables at ART initiation	Patients who achieved normal nutritional status	Time at risk (months)	Incidence rate (100 person month)	Crude hazard ratio (CHR)	95%CI
Age (median)	32			0.98	0.97-1.0
Sex					
Male	78	779.1	0.1		
Female	57	649.8	0.08	0.86	0.61-1.2
Education					
≤Junior high	51	623.2	0.08		
≥Senior high	84	805.6	0.1	1.31	0.92-1.8
Marital Status					
Not Married	52	612.7	0.08		
Married	83	816.2	0.10	1.16	0.82-1.65
Employment					
Unemployed, labourer, farmer	41	391.0	0.08		
Government worker, private sector, driver, entrepreneur	94	1037.9	0.09	1.00	0.69-1.44
Address					
Denpasar/Badung	63	800.4	0.09		
Outside Denpasar/ Badung	72	641.4	0.10	0.89	0.63-1.25
Waiting time for ART	38			0.99	0.99-1
Opportunistic infections					
Candidiasis					
No candidiasis	55	693.1	0.08		
Oral candidiasis	67	615.8	0.11	1.3	0.92-1.89
Oesophageal candidiasis	13	119.9	0.11	1.3	0.7-2.3
TB (yes)	22	199.5	0.11	1.17	0.74-1.8
Diarrhoea (yes)	15	96.3	0.15	1.59	0.93-2.7
CD4 (median)	44			0.90	0.82-0.98
Hemoglobin (median)	11.16			1.0	0.96-1.04
HIV clinical stadium					
I&II	5	132.6	0.4		
III	22	245.8	0.09	2.26	0.85- 5.9
IV	108	1050.3	0.10	2.69	1.09- 6.6
BMI (Median)	16.96			1.22	1.06-1.39
Body weight	44			1.02	0.99-1.06
ART regiments					
Contain TDF	63	624.7	0.10		
Contain AZT	69	624.1	0.09	0.86	
Others	3	23.2	0.13	1.22	

Table 3 Adjusted hazard ratio (AHR) for predictors of improved nutritional status

Variables at ART initiation	Adjusted hazard ratio (AHR)	95%CI	p value
BMI increment ≥1 kg/m^2	1.34	1.16-1.5	<0.001
Severe clinical stadium	1.45	1.02–2.06	0.035
CD4 count >50 sel/m^3	0.89	0.81-0.99	0.037
Presence of diarrhoea	1.83	1.06-3.14	0.028

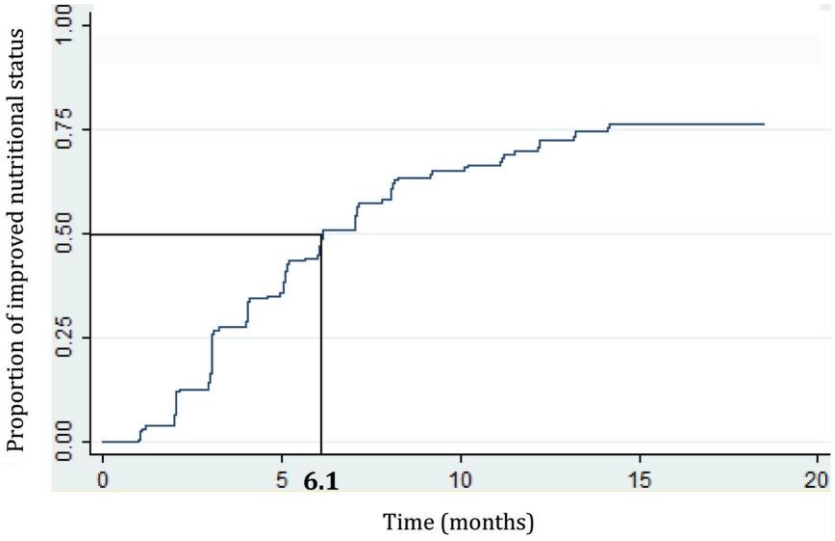

Figure 1 Kaplan meier of improved nutritional status

(9.66%) were dropped out before 18 months follow up. The incidence of improved nutritional status was 9.4 per 100 person months, with median time of 6.1 months (see Figure 1). The majority of improvement was observed on the 3rd month of the ART.

Table 2 shows the incidence of improved nutritional status by education, waiting time for ART, the presence of candidiasis and diarrhoea, CD4 count, HIV clinical stadium, BMI and body weight. It can be observed that the incidence of improved nutritional status significantly differed by HIV clinical stadium IV (crude hazard ratio/CHR=2.69; 95%CI: 1.09-6.6) and BMI level at ART initiation (CHR=1.22; 95%CI: 1.06-1.39). Intercorrelation between variables of body weight and BMI level at ART initiation was observed with coefficient correlation of 0.6. Thus only BMI variable was included in the multivariate analysis because it was more stable than the body weight.

Furthermore, we decided to include age and sex variables in the multivariate analysis even though from the bivariate analysis showed p value of >0.20. In the final model, we included age, sex, education, waiting time for ART, the presence of candidiasis and diarrhoea, CD4 count, HIV clinical stadium and BMI at ART initiation

Table 3 presents the results of multivariate analysis. Patients who started ART at a more advance HIV clinical stadium were more likely to reach a normal nutritional status (AHR=1.45; 95%CI: 1.02-2.06). Similarly, patients who presented with diarrhoea were also more likely to achieve an improved nutritional status (AHR=1.83; 95%CI: 1.06-3.14). Patients who had BMI increment of ≥1 kg/m^2 were 34% more likely to achieve an improved nutritional status (AHR=1.34; 95%CI: 1.16-1.5) than those who had BMI increment <1 kg/m^2. Patients who had CD4 count on admission >50sel/m^3 were less likely to achieve an improved nutritional status (AHR=0.89; 95%CI: 0.81-0.99).

DISCUSSION

This study found that within six months (median time), as many as 50% of patients reached normal nutritional status. This finding is relatively higher in comparison to other studies in Indonesia. A cohort study conducted in Dr. Soetomo General Hospital, Surabaya City found that as many as 44.7% out of 38 HIV/AIDS patients experienced an improved nutritional status within 12 months.[2] Other study in Teaching Hospital of Maiduguri, Nigeria using prospective cohort design also found that as many as 53.13% out of 107 HIV/AIDS patients reached a normal nutritional status within 12 months.[12] In addition, a study conducted at Rio de Janeiro Hospital using retrospective cohort design revealed that as many as 64.7% malnourished HIV/AIDS patients at ART initiation reached a normal nutritional status at the end of the observation period.[16]

An improved nutritional status in the present study was associated with several variables: body mass index, HIV clinical stage, CD4 count and the presence of diarrhoea at the ART initiation. Patients with BMI increment ≥1 kg/m^2 were **1.3** times more likely to reach a normal nutritional status (AHR=1.34; 95%CI=1.16-1.5). This finding is consistent with a study in Nigeria which found that HIV/AIDS patients who started ART with higher BMI were more likely to experience an improved nutritional status and required shorter period to achieve a normal nutritional status.[3] Other study also in Nigeria revealed that improvement on nutritional status was largely experienced by those who were malnourished at the ART initiation.[18]

Our study found that HIV/AIDS patients who started ART at the higher HIV clinical stadium were 1.4 times more likely to reach a normal nutritional status (AHR=1.45; 95%CI=1.02-2.06). This finding is consistent with a study conducted in Brazil which found that weight gain was largely observed among HIV/AIDS patients who started ART at the higher HIV clinical stadium.[16] Furthermore, our study revealed that patients with a higher CD4 count at the ART initiation were less likely to achieve a normal nutritional status (AHR=0.89; 95%CI: 0.81-0.99). This finding is consistent with other studies in Indonesia and other countries which found that a lower CD4 count at the ART initiation was significantly correlated with an improved nutritional status.[4,16] Our study also revealed that HIV/AIDS patients who presented with diarrhoea at the ART initiation were 1.8 times more likely to reach a normal nutritional status (AHR=1.83;

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95%CI: 1.06-3.14) when compared to those without diarrhoea.

Our study revealed that BMI increment, CD4 count, HIV clinical stage, and the presence of diarrhoea at the ART initiation were weak predictors for an improved nutritional status among HIV/AIDS patients – based on the value of AHR and 95%CI. This indicates that there are other stronger predictors for the improved nutritional status among HIV/AIDS patients including the nutritional intake. The improvement of nutritional status among HIV/AIDS patients is a direct result from the quality and frequency of nutrient intake during the ART period.[3,4,18] However, our study did not explore the nutrient intake variable because our study relied upon secondary data. In fact, data associated to the nutrient intake is not available at the medical record of patients who are on ART.

CONCLUSION

Predictors of improved nutritional status among HIV/AIDS patients who received ART at Sanglah General Hospital were body mass index at the ART initiation, HIV clinical stadium, CD4 count and the presence of opportunistic infection diarrhoea.

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