Clinical Signs and Laboratory Parameters as Predictors of Mortality among Hospitalized Human Immunodeficiency Virus-Infected Adult Patients at Tertiary Hospital in Surabaya

by Budi Utomo .

Submission date: 02-Mar-2022 02:03PM (UTC+0700)
Submission ID: 1774514914
File name: Artikel_23._Genap_20-21._Clinical_signs.pdf (554.84K)
Word count: 5018
Character count: 25819

Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia
Open Access Macedonian Journal of Medical Sciences. 2021 Jun 25; 9(B):497-502.
https://doi.org/10.3889/oamjms.2021.6223
eISSN: 1857-9655
Category: *B - Clinical Sciences*
Section: *Infective Diseases*

OPEN ACCESS

Clinical Signs and Laboratory Parameters as Predictors of Mortality among Hospitalized Human Immunodeficiency Virus-Infected Adult Patients at Tertiary Hospital in Surabaya

Rentha Monica Simamora[1,2], Muhammad Vitanata Arfijanto[1]*, Musofa Rusli[1], Budi Utomo[3], Cennikon Pakpahan[4], Garry Prasetyo Adi[1]

[1]Department of Internal Medicine, Faculty of Medicine, Airlangga University, Soetomo General Teaching Hospital, Surabaya, Indonesia; [2]Department of Internal Medicine, Dr. Kanudjoso Djatiwibowo General Hospital, Balikpapan, Indonesia; [3]Department of Public Health and Preventive Medicine, Faculty of Medicine, Airlangga University, Surabaya, Indonesia; [4]Department of Biomedical Sciences, Andrology Study Program, Faculty of Medicine, Airlangga University, Surabaya, Indonesia

Edited by: Ksenija Bogoeva-Kostovska
Citation: Simamora RM, Arfijanto MV, Rusli M, Utomo B, Pakpahan C, Adi GP. Clinical Signs and Laboratory Parameters as Predictors of Mortality Among Hospitalized Human Immunodeficiency Virus-Infected Adult Patients at Tertiary Hospital in Surabaya. Open Access Maced J Med Sci. 2021 Jun 25; 9(B):497-502. https://doi.org/10.3889/oamjms.2021.6223
Keywords: Predictors; Morbidity; Mortality; Human Immunodeficiency Virus/AIDS; Clinical sign; Laboratory parameters
Correspondence: Muhammad Vitanata Arfijanto, Department of Internal Medicine, Faculty of Medicine, Soetomo General Teaching Hospital, Airlangga University, Surabaya, Indonesia
E-mail: muhammad-v-a@fk.unair.ac.id
Received: 18-May-2021
Revised: 10-Jun-2021
Accepted: 15-Jun-2021

Funding: This research did not receive any financial support
Competing Interest: The authors have declared that no competing interest exists

Abstract

BACKGROUND: The morbidity and mortality rates due to human immunodeficiency virus (HIV) infection are still high despite various and advanced efforts in the management given for HIV/AIDS patients.

AIM: This study proposed that clinical signs and laboratory parameters could be expected to predict the patient's mortality.

METHODS: This retrospective study was done by collecting 408 medical records of adult HIV/AIDS inpatients at a tertiary hospital in Surabaya from January 1, 2017, to December 31, 2019. Bivariate analysis using Chi-square test was carried out on nine variables, which were Glasgow Coma Scale (GCS) <15, hypotension, PaO_2/FiO_2 <400 mmHg, elevated liver enzymes, hemoglobin levels <10 mg/dl, platelet count <150,000/mm^3, eGFR <60 ml/min/1.73 m^2, albumin levels <3.5 mg/dl, and body mass index (BMI) <18.5 kg/m^2. Variables which met the criteria would be included in the multivariate analysis using logistic regression.

RESULTS: Based on bivariate analysis, mortality was found to be significantly associated with GCS <15, hypotension, PaO_2/FiO_2, elevated liver enzymes, platelet count <100,000 mm^3, eGFR <60 ml/1.73kg/m^2, albumin levels <3.5 mgdl, and BMI <18.5 kg/m^2. However, based on multivariate analysis, there were five variables which were found to be able to independently predict the patients' mortality, those were GCS <15 (OR 11.625), hypotension (OR 6.062), PaO_2/FiO_2< 400 mmHg (OR 7.794), eGFR <60 ml/min/1.73 m^2 (OR 2.646), and albumin levels <3.5 mg/dl (OR 4.091).

CONCLUSION: GCS <15, hypotension, PaO_2/FiO_2 <400 mmHg, eGFR <60 ml/1.73g/m^2, and albumin levels <3.5 mg/dl were found as the independent risk factors which could predict the hospitalized HIV/AIDS patients' mortality.

Introduction

Human immunodeficiency virus (HIV) is a retrovirus that attacks human immune cells, especially CD4 T cells, resulting the decreasing of the number of CD4 T cells which then can cause the weakening of body's immune system [1]. HIV can directly damage body's tissues and organs through an inflammatory process that causes organ dysfunction and leads to mortality. Heretofore, HIV/AIDS has been becoming a global health problem with a high mortality rate and increasing number of sufferers every year [2], [3].

There have been various studies conducted to deepen the understanding of the characteristics and predictor factors of HIV-infected adult people's mortality. Some mortality predictors reported were platelets, glomerular filtration rate, liver function, serum albumin, CD4 values, and body mass index (BMI) [4], [5], [6]. The previous retrospective and prospective studies showed a variety of data relating to the characteristics of the research subject, socioeconomic conditions, and the length of the study conducted [7], [8], [9], [10].

Studies discussing about predictors of mortality among HIV/AIDS patients in Indonesia are still limited, whereas knowing the characteristics and factors that influence mortality is very important to improve medical interventions for HIV/AIDS patients. Therefore, this study was aimed to determine the characteristics and factors that could predict the HIV/AIDS patients' mortality using simple parameters through clinical signs and laboratory examinations that have been routinely carried out since the beginning of the patient hospitalization.

Methods

Study design and population

This research was conducted at a tertiary referral hospital in Surabaya, the capital of the province of East Java which has the highest number of HIV/AIDS sufferers in Indonesia. This study was a retrospective study done by collecting the medical record data which was obtained using systematic sampling from January 1, 2017, to December 31, 2019. The inclusion criteria included medical record of men and women inpatients aged ≥18 years who have been diagnosed with HIV/AIDS. The HIV/AIDS diagnosis was obtained from the ICD coding listed on the medical resume. Some data which were excluded in this study were including medical records of HIV/AIDS patients who discharged at their own request, patients who had traumatic brain injury, patients who had organ dysfunction before being diagnosed with HIV/AIDS, patients who had hematological disorders before being diagnosed with HIV/AIDS, patients diagnosed with cancer that was not related to HIV/AIDS, the pregnant patients, the missing data, the incomplete data, as well as the corrupt data.

Data collection

The data were collected using a data recording form which contained the characteristics and variables of the research. Characteristics of the research's subjects were in the form of demographic and clinical data. The demographic data included the patient's age, gender, place of residence, marital status, education level, HIV risk factors, and length of the hospital stay. Moreover, the clinical data included HIV clinical stage according to the WHO, ART therapy status, Glasgow Coma Scale (GCS), PaO_2/FiO_2 ratio, blood pressure, SGOT level, SGPT level, creatinine level, glomerular filtration rate, hemoglobin level, platelet count, serum albumin level, and BMI.

The independent variables in this study were GCS <15, hypotension, PaO_2/FiO_2 <400 mmHg, elevated liver enzymes, hemoglobin levels <10 mg/dl, platelet counts <150.000/mm^3, eGFR <60 ml/min/1.73 m^2, albumin level <3.5 mg/dl, and BMI <18.5 kg/m^2. Hypotension was defined as systolic blood pressure <100 mmHg or diastolic blood pressure <60 mmHg. Elevated liver enzymes were defined as SGOT levels with values above 50 μ/L or SGPT levels with values above 70 μ/L [11]. This study used the CKD-EPI formula for the glomerular filtration rate. Many studies suggested that the CKD-EPI formula was more preferable than MDRD and CG for calculating the glomerular filtration rate in the HIV patient population. The CKD-EPI formula did not require any information regarding body weight, unlike CG which used to bias the results of glomerular filtration rate [10], [12], [13].

Results

In this study, most of the HIV/AIDS patients hospitalized were male with a total of 274 people (67.2%). Furthermore, the female patients were 134 people or 32.8% of total data gained. In terms of age, it was found that the age ranged from 19 years old for the youngest to 70 years old for the eldest. Moreover, data of the patients' marital status were recorded as followed: 204 patients (50%) were married, 158 patients (38.7%) were single, and 46 patients (11.3%) were widowers or widows. In addition, most of the patients, which were 87.5% of total data or 357 patients to be exact, had high school education background.

The average length of HIV/AIDS patient's the hospital stay in this study was 4 days, with 1 day for the shortest treatment duration and 54 days for the longest one. In terms of transmission risk factors, there were 81 patients (19.8%) heterosexual risk, which was the highest risk factor in this study according to the data which has been collected. Most of the patients, specifically 390 patients (95.6%) were domiciled in Surabaya, while only 18 patients (4.4%) were domiciled outside Surabaya. Based on further data from 408 patients who underwent the treatment, it was known that the mortality rate was 31.1% (127/408).

The clinical characteristics used in this study included ART therapy status, the WHO clinical stage, GCS, PaO_2/FiO_2 ratio, systolic and diastolic blood pressure, eGFR, SGOT, SGPT, hemoglobin, platelets, albumin, and BMI. These clinical characteristics are shown in Table 1.

From the medical record data collected, it was known that 207 patients (50.7%) were on ART therapy, 173 patients (42.4%) had never received ART treatment, and 28 patients (6.9%) stopped taking ART treatment. Most of the subjects in this study, as many as 299 patients (73.3%), were at Stage 4 based on the WHO clinical stage. A total of 322 patients (78.9%) had a GCS of 15. The data of PaO_2/FiO_2 ratio showed the ratio value of ≥400 in 286 patients (70.1%) and <400 in 122 patients (29.9%). As many as 322 patients (78.9%) had systolic blood pressure of ≥100 mmHg. Moreover, most of the patients had diastolic blood pressure of ≥60 mmHg, while 46 patients (11.3%) had diastolic blood pressure below 60 mmHg.

Based on the obtained data, there were 312 patients (76.5%) who had eGFR ≥60 ml/min/1.73 m^2. The AST data showed that 199 patients (48.8%) had AST ≤50 μ/L, which was almost the same as those with AST >50 μ/L, specifically 209 patients (51.2%). The SGPT data reported that most patients had SGPT values ≤70 μ/L, specifically 332 patients (81.4%). As for the hemoglobin data, there was no significant difference between the ones who had Hb ≥10 mg/dl and the ones

Table 1: Clinical characteristics

Characteristic	n	%	Result
ART therapy status			
Naive	173	42.4	
Receiving ART	207	50.7	
Loss to follow-up	28	6.9	
WHO clinical stage			
Stage 1	0	0	
Stage 2	0	0	
Stage 3	109	26,7	
Stage 4	299	73,3	
GCS			
GCS =15	322	78.9	
GCS <15	86	21.1	
PaO_2/FiO_2			
PaO_2/FiO_2 ≥400	286	70.1	
PaO_2/FiO_2 <400	122	29.9	
Systolic blood pressure			
≥100 mmHg	322	78.9	
<100 mmHg	86	21.1	
Diastolic blood pressure			
≥60 mmHg	362	88.7	
<60 mmHg	46	11.3	
eGFR			
eGFR ≥60 ml/menit/1.73 m^2	312	76.5	
eGFR <60 ml/menit/1.73 m^2	96	23.5	
SGOT			
SGOT ≤50 µ/L	199	48.8	
SGOT >50 µ/L	209	51.2	
SGPT			
SGPT ≤70 µ/L	332	81.4	
SGPT >70 µ/L	76	18.6	
Hemoglobin			
Hb ≥10 mg/dl	206	50.5	
Hb <10 mg/dl	202	49.5	
Platelet count			
≥150,000/mm^3	323	79.2	
<150,000/mm^3	85	20.6	
Albumin levels			
≥3.5 mg/dl	154	37.7	
<3.5 mg/dl	254	62.3	
BMI			
BMI ≥18.5 kg/m^2	205	50.2	
BMI <18.5 kg//m^2	203	49.8	

GCS: Glasgow Coma Scale, BMI: Body mass index.

who had Hb <10 mg/dl. There were at least 206 patients (50.5%) who had Hb ≥10 mg/dl and 202 patients (49.5%) who had Hb <10 mg/dl. In addition, most of the patients, specifically 323 patients (79.2%) had ≥150,000 platelet count. Moreover, there were 254 patients (62.3%) who had an albumin value <3.5 mg/dl and 205 patients (50.2%) had a BMI ≤18.5 kg/m^2.

The bivariate analysis in this study used Chi-square analysis in which if $p < 0.05$, the variable would be feasible to be included in the multivariate analysis. From the results of the bivariate analysis, there were eight variables that had a significant correlation with the HIV/AIDS patients' mortality, namely, GCS <15 ($p = 0.000$), the ratio of PaO_2/FiO_2 ($p = 0.000$), hypotension ($p = 0.000$), eGFR < 60 ml/min/1.73 m^2 ($p = 0.000$), platelet count <150.000 mm^3 ($p = 0.012$), albumin level <3.5 mg/dl ($p = 0.000$), and BMI ≤18.5 kg/m^2 ($p = 0.000$). These eight variables would be included in the multivariate analysis to see which variable was dominant in influencing the hospitalized HIV/AIDS patients' mortality.

Multivariate analysis in this study used logistic regression analysis. The multivariate analysis which showed significant independent variables on the HIV/AIDS patients' mortality in this study was including GCS <15 (OR 11.625), PaO_2/FiO_2 <400 mmHg (OR 7.794), hypotension (OR 6.062), eGFR <60 ml/min/1.73 m^2 (OR 2.646), and albumin levels <3.5 mg/dl (OR 4.091). These bivariate analysis and multivariate analysis are shown in Table 2.

Table 2: Analysis univariate and multivariate

Variable	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
GCS <15	11.960 (6.851–20.878)	0.000	11.625 (5.410–24.981)	0.000
PaO_2/FiO_2 <400 mmHg	11.705 (7.114–19.259)	0.000	7.794 (4.063–14.950)	0.000
Hypotension	12.738 (7.259–22.240)	0.000	6.062 (2.980–12.329)	0.000
eGFR <60 ml/min/1.73 m^2	3.317 (2.061–5.340)	0.000	2.646 (1.314–5.328)	0.008
Elevated transaminase enzyme	3.216 (2.051–5.043)	0.000	1.824 (0.946–3.516)	0.104
Hemoglobin <10 mg/dl	1.452 (0.952–2.213)	0.082		
Platelet count <150,000/mm^3	1.873 (1.143–3.069)	0.012		
Albumin levels <3.5 mg/dl	5.680 (3.274–9.852)	0.000	4.091 (1.846–9.070)	0.001
BMI <18.5 kg/m^2	2.940 (1.891–4.571)	0.000	1.738 (0.919–3.264)	0.078

GCS: Glasgow Coma Scale, BMI: Body mass index.

Discussion

Neurological disorders associated with HIV/AIDS include central nervous system infections, neoplasms, vascular complications, peripheral neuropathy, and myopathy. Various studies which have been conducted in developing countries showed that most neurological disorders occurred due to the opportunistic infections [14]. The most frequently used parameter for measuring the impaired central nervous system function is the GCS, which is a neurological scale that aims to assess a person's consciousness. Parameters of organ function disorders, such as APACHE II and SOFA score, classify the central nervous system dysfunction if the GCS is <15 [15].

In this study, GCS <15 was a very significant variable on the hospitalized HIV/AIDS patients' mortality (OR 1.625; CI 95% 5.410–24.981; p = 0.000). The results of this study supported previous study's result in which the patients with GCS <15 had death risk of 7.84 times higher (95% CI 2.03–30.27) [16], [17]. The rate resulted from the previous study was lower than the research we conducted. This could be caused by the differences of the study subjects' characteristics.

Respiratory system disorders are complications which are often found in HIV/AIDS patients and cause morbidity as well as mortality. The mechanism of HIV in causing respiratory system disorders, which in this case is lung damage, is related to systemic and lungs inflammation. Other factors which also play a role in causing lung damage are direct HIV infection to the lungs, smoking, and the effect of ARVs on lung toxicity [18]. PaO_2/FiO_2 ratio is an indicator of respiratory disorders, which in this study referred to the limit according to the SOFA score. In this study, PaO_2/FiO_2 ratio had a significant correlation with the mortality of HIV/AIDS patients with an OR 7.794 (95% CI 4.063–14.950). A study using the PaO_2/FiO_2 ratio was also conducted by Chiliza *et al*. in which the subjects were HIV patients with PCP infection. In this study, the PaO_2/FiO_2 ratio was considered as a significant predictor of mortality (HR 3.8; 95% CI 1.68.9; p = 0.0030) [19]. Likewise, the similar result was also found in a study conducted by Wu *et al*., in which PaO_2 <70 as one of the mortality predictors had an HR of 7.328 (95% CI 3.621–14.830) on HIV/AIDS patients' mortality [20].

Cardiovascular dysfunction in HIV/AIDS patients can be caused by direct viral mechanisms, opportunistic infections, and the use of ART [21]. The mechanism of the HIV virus in causing myocardial damage remains unclear. However, it is suspected that there are changes in the function of Th lymphocytes which then cause severe inflammation of the myocardium [22]. Opportunistic infections caused by *Toxoplasma gondii*, *Mycobacterium tuberculosis*, and *Cryptococcus neoformans* are common in AIDS myocarditis [23]. Treatment with ARVs, especially for the NRTI group, causes a lot of cardiomyopathy through mitochondrial damage which eventually causes myocardial dilatation and dysfunction. Moreover, hypotension is a condition that occurs due to impaired cardiovascular function. This condition indicates the decreasing of cardiac output which can lead to impaired tissue perfusion [24]. This study found that hypotension correlated significantly with the mortality of HIV/AIDS patients by which an OR of 6.062 (95% CI OR 2.980–12.329). These results supported previous research conducted by Bloomfield *et al.* which resulted IR value of 5.2 (CI 95% 4.8–5.7) [25].

HIV-infected patients have a higher risk of developing kidney disease, terminal renal failure, and death due to kidney disease. A study carried out on 306 HIV/AIDS patients in China found that the prevalence of kidney problems experienced by hospitalized HIV/AIDS patients reached 5.56% [26]. Disruption of kidney function in HIV/AIDS-infected patients can be caused by acute kidney failure, HIV-associated nephropathy, and the presence of comorbid chronic kidney disease [27]. Multivariate analysis done in this study showed that impaired renal function had a significant correlation to HIV/AIDS patients' mortality with an OR 2.646 (95% CI 1.314–5.328). This study supported the research conducted in Jakarta [6] as well as the research conducted by Wyatt *et al.* However, there was a slight difference between the result of this study and a study conducted by Wyatt et al. Categorized into acute renal failure and chronic kidney disease, Wyatt et al study stated that acute renal failure (OR=5.84; 95% CI 5.11-6.65) possessed higher mortality risk compared to chronic kidney disease (OR=1.97%; 95% CI 1.59-2.45) [28].

Reduced glomerular filtration rate is associated with the increasing of cardiovascular events causing mortality in general population. In populations with decreased glomerular filtration, there was an increase in apolipoprotein B and a decrease in apolipoprotein A1, which is a risk factor for coronary heart disease. It was also found that there was an increase in fibrinogen and homocysteine, as well as C-reactive protein which is associated with atherosclerosis. The atherosclerosis itself can increase the risk of cardiovascular disease in the decreased glomerular filtration population [29]. The decreasing of erythropoietin hormone can cause anemia which then results in increasing the endothelial activation and left ventricular hypertrophy. This condition can increase the cardiovascular risk which leads to morbidity and mortality [30]. Disorders of electrolytes or acid base and fluid retention in impaired kidney function can also increase the mortality risk [6].

Several studies have also tried to find a correlation between low albumin levels and mortality in HIV/AIDS patients. Some have found that hypoalbuminemia could be an independent predictor of HIV/AIDS patients' mortality. Low albumin levels (<3.5 g/dl) are associated with the progression of HIV patients to AIDS [8], [28]. In subjects with CD4 <200 who had albumin levels <3.5 g/dl, the mortality rate was 8 times higher than those with albumin levels > 3.5 g/dl [8]. Research on the correlation between serum albumin and mortality in HIV/AIDS patients has also been conducted and showed that patients with albumin levels <3.5 g/dl at the beginning of ART therapy had mortality rate 4.53 times higher than the subjects who had albumin levels >3.5 g/dl (95% CI) [31]. In our study, albumin levels <3.5 mg/dl had a significant correlation with the HIV/AIDS patients' mortality (OR 4.091, 95% CI OR 1.846–9.070). Furthermore, receiver operating characteristic (ROC) curve analysis was also performed for the hypoalbuminemia variable. Based on the analysis of the ROC curve, it was found that the area under the curve was 0.751 with p = 0.027. The best cutoff point for albumin level to predict mortality outcome was in the value of 3.02 with sensitivity of 71.7% and specificity of 70.5% (Figure 1).

There were also some variable which showed insignificant result in multivariate analysis, those were platelet count, elevated liver enzymes, and BMI. Platelet count <150,000 mm^3 in HIV/AIDS patients causes mortality, generally due to the occurrence

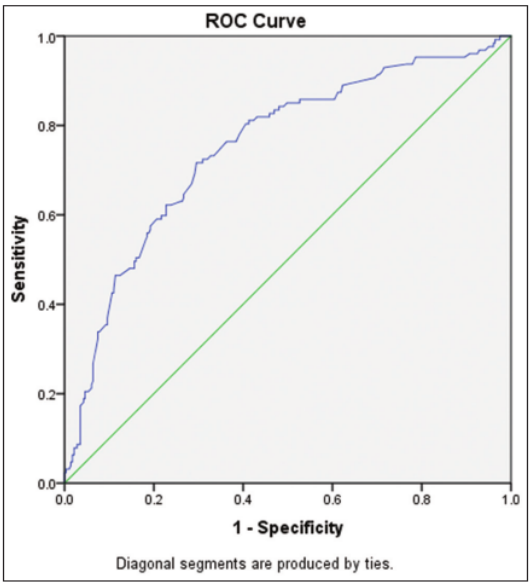

Figure 1: Receiver operating characteristic curve hypoalbuminemia to predict mortality. The best cutoff point value for albumin level for predicting the mortality outcome was 3.02 with sensitivity of 71.7% and specificity of 70.5%

of impaired central nervous system function which caused by intracranial bleeding characterized by the GCS. Elevated liver enzymes can be associated with mortality generally through the occurrence of acute liver failure causing encephalopathy which eventually leads to impaired central nervous system function which is also characterized by GCS. BMI <18.5 kg/m^2 can cause mortality due to susceptibility toward hypoalbuminemia-associated infection, in which hypoalbuminemia itself showed a significant correlation with HIV/AIDS hospitalized patients' mortality in multivariate analysis.

Conclusion

The mortality percentage of hospitalized HIV/AIDS patients in this study was recorded at the value of 31.1%. Multivariate analysis which showed GCS <15, hypotension, PaO_2/FiO_2 <400 mmHg, eGFR 60 ml/1.73 kg/m^2, and albumin levels <3.5 mg/dl was found as an independent risk factors for predicting the hospitalized HIV/AIDS patients' mortality. Early intervention on these significant variables is expected to be able to improve the mortality rate of hospitalized HIV/AIDS patients.

Acknowledgments

The author thanks to Inthen Firdausi Wardhani for providing language corrections to this article.

References

1. Djoerban Z, Djauzi S. HIV/AIDS di Indonesia in Buku Ajar Ilmu Penyakit Dalam. 6th ed., Vol. 1. Jakarta: Balai Penerbit FKUI; 2015.
2. Japiassu AM, Amancio RT, Mesquita EC, Medeiros DM, Bernal HB, Nunes EP, *et al*. Sepsis is a major determinant of outcome in critically ill HIV/AIDS patients. Crit Care. 2010;14(4):R152. https://doi.org/10.1186/cc9221
   PMid:20698966
3. Redig AJ, Berliner N. Pathogenesis and clinical implications of HIV-related anemia in 2013. Hematol Am Soc Hematol Educ Program. 2013;2013(1):377-81. https://doi.org/10.1182/asheducation-2013.1.377
   PMid:24319207
4. Saleri N, Capone S, Pietra V, Iaco G, Del Punta V, Rizzi M, *et al*. Outcome and predictive factors of mortality in hospitalized HIV-patients in burkina faso. Infection. 2009;37(2):142-7. https://doi.org/10.1007/s15010-008-7406-7
   PMid:19169635
5. Rubaihayo J, Tumwesigye NM, Konde-lule J, Makumbi F, Nakku EJ, Wamani H, *et al*. Trends and predictors of mortality among HIV positive patients in the era of highly active antiretroviral therapy in Uganda. Infect Dis Rep. 2015;7(3):66-73. https://doi.org/10.4081/idr.2015.5967
   PMid:26500739
6. Puspitasari E, Yunihastuti E, Rengganis I, Rumende CM. Prediktor mortalitas pasien HIV/AIDS rawat inap. J Pen Dalam Indones. 2016;3(1):22-8. https://doi.org/10.7454/jpdi.v3i1.29
7. Deshwal R, Arora S. Serum alanine aminotransferase elevations in HIV positive patients on antiretroviral therapy in India. J Assoc Phys India. 2019;67(3):67-70.
   PMid:31304710
8. Feldman JG, Burns DN, Stephen J, Bacchetti P, Cohen M, Anastos K, *et al*. Serum albumin as a predictor of survival in HIV-infected women in the women's interagency HIV study. AIDS. 2000;14(7):863-70. https://doi.org/10.1097/00002030-200005050-00013
   PMid:10839595
9. Hu W, Jiang H, Chen W, He S, Deng B, Wang W. Malnutrition in hospitalized people living with HIV/AIDS : Evidence from a cross-sectional study from Chengdu, China. Asia Pac J Clin Nutr. 2011;20(4):544-50.
   PMid:22094839
10. Ibrahim F, Hamzah L, Jones R. Baseline kidney function as predictor of mortality and kidney disease progression in HIV-positive patients. Am J Kidney Dis. 2012;60(4):539-47. https://doi.org/10.1053/j.ajkd.2012.03.006
    PMid:22521282
11. Dusingize JC, Hoover DR, Shi Q, Mutimura E, Rudakemwa E, Ndacyayisenga V, *et al*. Association of abnormal liver function parameters with HIV serostatus and CD4 count in antiretroviral-naïve rwandan women. AIDS Res Hum Retroviruses. 2015;31(7):723-30. https://doi.org/10.1089/aid.2014.0170
    PMid:25924728
12. Owiredu WK, Quaye L, Amidu N, Addai-Mensah O. Renal insufficiency in Ghanaian HIV infected patients: Need for dose adjustment. Afr Health Sci. 2013;13(1):101-11. https://doi.org/10.4314/ahs.v13i1.14
    PMid:23658575
13. Mocroft A, Ryom L, Reiss P, Furrer H, Monforte AD, Gatell J, *et al*. A comparison of estimated glomerular filtration rates using Cockcroft-Gault and the chronic kidney disease epidemiology collaboration estimating equations in HIV infection. HIV Med. 2014;15(3):144-52. https://doi.org/10.1111/hiv.12095
    PMid:24118916
14. Mamidi A, DeSimone JA, Pomerantz RJ. Central nervous system infections in individual with HIV-1 infection. J Neurovirol. 2002;8(3):158-67. https://doi.org/10.1080/13550280290049723
    PMid:12053271
15. Grmec S, Gasparovic V. Comparison of APACHE II, MEES and Glasgow coma scale in patients with nontraumatic coma for prediction of mortality. Crit Care. 2000;5(1):19-23. https://doi.org/10.1186/cc973
    PMid:11178221
16. Lee Y, Wang J, Sun H, Chen Y. Comparisons of clinical features and mortality of cryptococcal meningitis between patients with and without human immunodeficiency virus infection. J Microbiol Immunol Infect 2011;44(5):338-45. https://doi.org/10.1016/j.jmii.2010.08.011
    PMid:21524972
17. Pecego AC. Amancio RT, Ribeiro C, Mesquita EC, Medeiros DM, Cerbino J, *et al*. Six-month survival of critically ill patients with HIV–related disease and tuberculosis: A retrospective study. BMC Infect Dis. 2016;6:270. https://doi.org/10.1186/s12879-016-1644-6

18. Cribbs SK, Crothers K, Morris A. Pathogenesis of HIV-related lung disease: Immunity, infection, and inflammation. Physiol Rev. 2020;100(2):603-32. https://doi.org/10.1152/physrev.00039.2018
PMid:31600121

19. Chiliza N, Du Toit M, Wasserman S. Outcomes of HIV-associated pneumocystis pneumonia at a South African referral hospital. PLoS One. 2018;13(8):e0201733. https://doi.org/10.1371/journal.pone.0201733
PMid:30071089

20. Wu L, Zhang S, Wang Y, Hao Y, Wang F, Gao G, *et al*. A model to predict in-hospital mortality in HIV/AIDS patients with pneumocystis pneumonia in China: The clinical practice in real world. Biomed Res Int 2019;2019:6057028. https://doi.org/10.1155/2019/6057028
PMid:30906778

21. Ho JE, Hsue PY. Cardiovascular manifestations of HIV infection. Heart. 2009;95(14):1193-202. https://doi.org/10.1136/hrt.2008.161463
PMid:19564432

22. Moroni M, Antinori S. HIV and direct damage of organs: Disease spectrum before and during the highly active antiretroviral therapy era. AIDS. 2003;17(1):S51-64. https://doi.org/10.1097/00002030-200304001-00008
PMid:12870531

23. Ntusi NA. HIV and myocarditis. Curr Opin HIV AIDS. 2017;12(6):561-5. https://doi.org/10.1097/coh.0000000000000416
PMid:28832366

24. Cheitlin MD. In: Basow DS, editor. Cardiac Involvement in HIV-infected Patients. 2nd ed. Waltham, MA: UptoDate; 2010.

25. Bloomfield GS, Hogan JW, Keter A, Holland TL, Sang E, Kimaiyo S, *et al*. Blood pressure level impacts risk of death among HIV seropositive adults in Kenya: A retrospective analysis of electronic health records. BMC Infect Dis. 2014;14:284. https://doi.org/10.1186/1471-2334-14-284
PMid:24886474

26. Sun C, Wen Y, Liu S, Cui W, Zhou Y, Deng, B, *et al*. Prevalence of ginjal impairment among HIV positive patients hospitalized in the first hospital of China medical university. Int J Clin Exp Med. 2018;11(8):8622-862.

27. Wyatt CM. Kidney disease and HIV infection. Top Antivir Med. 2017;25(1):13-6.
PMid:28402929

28. Wyatt CM, Klotman PE, Bronfman S, D'Agati VD. HIV-associated nephropathy: Clinical presentation, pathology, and epidemiology in the era of antiretroviral therapy. Semin Nephrol. 2008;28(6):513-22. https://doi.org/10.1016/j.semnephrol.2008.08.005
PMid:19013322

29. Munthner P, Hamm L, Kusek JW, Chen J, Whelton PK, He J. The prevalence of nontraditional risk factors for coronary heart disease in patients with chronic kidney disease. Ann Intern Med. 2004;140(1):9-17. https://doi.org/10.7326/0003-4819-140-1-200401060-00006
PMid:14706967

30. George E, Lucas GM, Nadkarni GN, Fine DM, Moore R, Atta MG. Kidney function and the risk of cardiovascular events in HIV-1 infected patients. AIDS. 2010;24(3):387-94. https://doi.org/10.1097/qad.0b013e3283359253
PMid:20019575

31. Sudfeld CR, Isanaka S, Aboud S, Mugusi FM, Wang M, Chalamilla GE, *et al*. Association of serum albumin concentration with mortality, morbidity, CD4 T-cell reconstitution among tanzanians initiatin antiretroviral therapy. J Infect Dis. 2013;207(9):1370-8.
PMid:23319741

Clinical Signs and Laboratory Parameters as Predictors of Mortality among Hospitalized Human Immunodeficiency Virus-Infected Adult Patients at Tertiary Hospital in Surabaya

ORIGINALITY REPORT

18%	13%	15%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Udayana University Student Paper	1%
2	Irda Handayani, Muhammad Nasrum Massi, Yanti Leman, Rosdiana Natzir et al. "Composite Bacterial Infection Index and Serum Amyloid A Protein in Pulmonary Tuberculosis Patients and their Household Contacts in Makassar", Open Access Macedonian Journal of Medical Sciences, 2021 Publication	1%
3	www.dovepress.com Internet Source	1%
4	Submitted to iGroup Student Paper	1%
5	www.tandfonline.com Internet Source	1%
6	Firas Farisi Alkaff, Fauzan Illavi, Sovia Salamah, Wiwit Setiyawati, Ristra Ramadhani,	1%

	Elly Purwantini, Dicky L. Tahapary. "The Impact of the Indonesian Chronic Disease Management Program (PROLANIS) on Metabolic Control and Renal Function of Type 2 Diabetes Mellitus Patients in Primary Care Setting", Journal of Primary Care & Community Health, 2021 Publication	
7	pubmed.ncbi.nlm.nih.gov Internet Source	1 %
8	"Global Virology II - HIV and NeuroAIDS", Springer Science and Business Media LLC, 2017 Publication	1 %
9	aidsrestherapy.biomedcentral.com Internet Source	1 %
10	www.hindawi.com Internet Source	1 %
11	Anastasia Venny Fransisca Sipayung, Elmeida Effendy, Mustafa Mahmud Amin. "Risk Factors for Anxiety in Medical Health Workers during Coronavirus Disease 2019 in Medan, Indonesia", Open Access Macedonian Journal of Medical Sciences, 2021 Publication	<1 %
12	turkjphysiotherrehabil.org Internet Source	<1 %

13	Submitted to University of Mosul Student Paper	<1 %
14	assets.researchsquare.com Internet Source	<1 %
15	research.hanze.nl Internet Source	<1 %
16	www.scielo.br Internet Source	<1 %
17	www.science.gov Internet Source	<1 %
18	Haldun Selcuk, Irfan Uruc, Mehtap Akcil Temel, Serkan Ocal et al. "Factors Prognostic of Survival in Patients Awaiting Liver Transplantation for End-Stage Liver Disease", Digestive Diseases and Sciences, 2007 Publication	<1 %
19	"SIOP ABSTRACTS", Pediatric Blood & Cancer, 2019 Publication	<1 %
20	Formiga, F.. "Functional outcomes of elderly patients after the first hospital admission for decompensated heart failure (HF)", Archives of Gerontology and Geriatrics, 200609/10 Publication	<1 %
21	Pediatric Nephrology, 2016. Publication	<1 %

22	Ronit Elhasid, Arie Laor, Sophie Lischinsky, Sergey Postovsky, Myriam Weyl Ben Arush. "Nutritional status of children with solid tumors", Cancer, 1999 Publication	<1 %
23	Sicotte, Maryline, Chantal Bemeur, Assane Diouf, Maria Victoria Zunzunegui, and Vinh-Kim Nguyen. "Nutritional status of HIV-infected patients during the first year HAART in two West African cohorts", Journal of Health Population and Nutrition, 2015. Publication	<1 %
24	Elrica Erica, Dina Keumala Sari, Dewi Indah Sari Siregar, Juli Yosa Mega. "Vitamin D and Hemostasis Parameters in Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome Patients with Pulmonary Tuberculosis Coinfections", Open Access Macedonian Journal of Medical Sciences, 2020 Publication	<1 %
25	Yukako Soejima, Hideki Yoshioka, Sayuri Guro, Hiromi Sato et al. "Exercise Training Outcomes in Patients with Chronic Heart Failure with Reduced Ejection Fraction Depend on Medications and Disease Conditions: Proposal of SEEM Score to Judge	<1 %

Exercise Suitability", Cold Spring Harbor Laboratory, 2022
Publication

26	journals.lww.com Internet Source	<1%
27	Muhammad David Perdana Putra, Kristanto Yuli Yarso, Brian Wasita. "Neoadjuvant Chemotherapy Effect on Predictive Value of Sentinel Lymph Node Biopsy using Single Method Methylene Blue in Breast Cancer Patients at Low-resource Country", Open Access Macedonian Journal of Medical Sciences, 2021 Publication	<1%
28	academic.oup.com Internet Source	<1%
29	Clinicaltrials.gov Internet Source	<1%
30	Rodrigo T. Amancio, Andre M. Japiassu, Rachel N. Gomes, Emersom C. Mesquita et al. "The Innate Immune Response in HIV/AIDS Septic Shock Patients: A Comparative Study", PLoS ONE, 2013 Publication	<1%
31	cyberleninka.org Internet Source	<1%

32	Davide Gibellini, Marco Borderi, Alberto Clò, Silvia Morini, Anna Miserocchi, Isabella Bon, Cristina Ponti, Maria Carla Re. "HIV-related mechanisms in atherosclerosis and cardiovascular diseases", Journal of Cardiovascular Medicine, 2013 Publication	<1 %
33	elsevier.pt Internet Source	<1 %
34	jurnalpenyakitdalam.ui.ac.id Internet Source	<1 %
35	tsukuba.repo.nii.ac.jp Internet Source	<1 %
36	www.bmj.com Internet Source	<1 %
37	www.findarticles.com Internet Source	<1 %
38	Cameron C. Lee, Tim T. Wang, William P. Hunter, Zachary S. Peacock. "Is Preoperative Serum Albumin Predictive of Adverse Surgical Outcomes in Maxillofacial Fracture Repair?", Journal of Oral and Maxillofacial Surgery, 2021 Publication	<1 %
39	N. Taguchi. "Influence of socio-economic background and antenatal care programmes on maternal mortality in Surabaya,	<1 %

Indonesia", Tropical Medicine and International Health, 9/2003
Publication

40	Ruiqing Tong, Ying Zhou, Qi He, Yanyan Zhuang, Weiqin Zhou, Fei Xia. "Analysis of the guidance value of 3D ultrasound in evaluating endometrial receptivity for frozen-thawed embryo transfer in patients with repeated implantation failure", Annals of Translational Medicine, 2020 Publication	<1 %
41	Samer Bani-Hani. "Renal disease in AIDS: it is not always HIVAN", Clinical and Experimental Nephrology, 01/06/2010 Publication	<1 %
42	bmcmedicine.biomedcentral.com Internet Source	<1 %
43	core.ac.uk Internet Source	<1 %
44	link.springer.com Internet Source	<1 %
45	uir.unisa.ac.za Internet Source	<1 %
46	Alan S. Go. "Chronic Kidney Disease and the Risks of Death, Cardiovascular Events, and Hospitalization", New England Journal of Medicine, 09/23/2004	<1 %

Publication

47	Christina M Wyatt. "Acute renal failure in hospitalized patients with HIV: risk factors and impact on in-hospital mortality", AIDS, 02/2006 Publication	<1 %
48	Kefale Lejadiss Workie, Tilahun Yemanu Birhan, Dessie Abebaw Angaw. "Predictors of mortality rate among adult HIV-positive patients on antiretroviral therapy in Metema Hospital, Northwest Ethiopia: a retrospective follow-up study", AIDS Research and Therapy, 2021 Publication	<1 %
49	caiherang.com Internet Source	<1 %
50	Anggi Lukman Wicaksana, Nurul Dyah Kusumawati, Ella Permatasari Wibowo, Hera Nirwati. "Development of a COVID-19 University-Based Clinic in Indonesia: A Pilot Project of The Gadjah Mada Electronic Nose Center", Open Access Macedonian Journal of Medical Sciences, 2022 Publication	<1 %

Exclude quotes	Off	Exclude matches	Off

Exclude bibliography On