Contents lists available at IOCS

Science Midwifery

journal homepage: www.midwifery.iocspublisher.org

Cross sectional association of nutrition intake and caracteristic with nutritional status of HIV patients

Endang Sri Wahyuni[1*], Yulia Novika J[2], Sutrio[3]
[1,2,3]Jurusan Gizi, Poltekkes Kemenkes Tanjung Karang, Lampung, Indonesia

ARTICLE INFO

Article history:

Received Dec 21, 2024
Revised Dec 30, 2024
Accepted Jan 6, 2025

Keywords:

Characteristic
HIV
Nutritional Status
Nutrition Intake

ABSTRACT

Nutritional status is associatesd with both quality of life and mortality risk in individuals with HIV. Adequate nutrition intake enhance resilience againts opportunistic infections in HIV patients. The aim of this study is determine factors associated with nutritional status. This study was using cross sectional design that involved 99 participants that were determined by consecutive sampling. The participants were HIV patients who were outpatient at Kanca Sehati Polyclinic, Dr Hi Abdul Moeloek Hospital, Lampung on Juli – August 2024. The dependent variable is nutritional status and the independent variables are the characteristics and nutrition intake of HIV patient. Nutritional status is determined by calculating Body Mass Index (BMI), characteristic data were colected from medical records and interviews, nutrition intake form SQ FFQ (Semi Quantitative Food Frequency). Data were analyzed by chi square. The results of this study show that the common range of age is 21 – 40 years old (78.78%), the common education level is secondary education (62%), the majority of participants' occupation was self-employment (29%). Participants received ART treatment <1 year are 50%, and 12% of participants have gastrointestinal disorders. Participants with underweight are 27% and overweight are 13%. Participants who have energy intake deficit are 37%, protein intake category are 54%. The statistical tests show that nutritional status are related to type of work (0.003) and medication consumed (p=0.015), nutritional status is not associated with gender, age, education, employment, duration of taking medication, energy intake or protein intake.

Corresponding Author:

Endang Sri Wahyuni,
Jurusan Gizi,
Poltekkes Kemenkes Tanjungkarang,
Bandar Lampung, Lampung, 35146, Indonesia,
Email: end_wahyuni71@poltekkes-tjk.ac.id

INTRODUCTION

Human Immunodeficiency Virus (HIV) is a virus that attacks immune system and make immune system does not have the ability to protect the body from opportunistic infections. This virus can be found in blood, cervical mucus, seminal fluid, and breast milk (Kemenkes, 2019).

HIV is a global public health problem, currently estimated to affect 42.3 million people. By the end of 2023, it is estimated that 39.9 million people are living with HIV with 630,000 people

estimated have died from HIV and around 1.3 million people have contracted HIV (WHO, 2024). "WHO in 2022–2030 is targeting a reduction in HIV infections from 1.5 million in 2020 to 335,000 in 2030, as well as deaths due to HIV/AIDS from 680,000 in 2020 to <240,000 in 2030" (Kurniawati et al., 2021). For the period January – June 2022, 22,331 people were found to be HIV positive from 503 cities in Indonesia, out of 2,018,641 people tested for HIV, and 18,479 people received ART treatment (Kemenkes, 2022). Nutritional status is related to death in HIV/AIDS children (Amelia, 2021). Study in Nepal on 301 HIV patients, 19.9% had undernutrition status and 9.7% had overnutrition status (Thapa et al., 2015). A total of 191 children were diagnosed with HIV at Dr Sardjito Hospital, 28.8% of them had poor nutritional status and 40.3% of them have poor nutritional status (Indrawanti et al., 2021). Nutritional status in HIV patient is related to quality of life in the domains of physical problems, emotional problems, pain, vitality, and mental well-being). Nutritional status is not related to quality of life in the domains of physical function, social function, and general health perception (Anderson et al., 2017). Study in Nepal in 301 HIV patients showed a significant association between nutritional status and the quality of life (Thapa et al., 2015). The study on 82 HIV patients in Cameroon shown 8.5% had poor nutritional status, 35.4% were overweight and 11% were obese (Perpetue et al., 2021). Study on 350 HIV patients found that 18.3% of HIV patients were malnourished and 39.1% had the nutritional status of overweight or obesity (39.1%) (Khatri et al., 2020). Insufficient protein intake in HIV patients will suppress the immune system (Maragareth et al., 2019). Low nutritional intake in HIV patients is caused by a poor diverse diet. As many as (62.3%) of HIV patients have poor diverse food intake (Khatri et al., 2020). As many as 86.4% had energy intake less than requirements and 75% had protein intake >15% requirements (Fossoh et al., 2021). The presence of comorbidities in HIV/AIDS patients is related to their nutritional status, while gender is not related to nutritional status (Sitorus et al., 2022). Weight loss and malnutrition often occur in HIV/AIDS patients. This risks accelerating the development of the disease, increasing morbidity and reducing survival. Counseling and nutritional support in the early stages of infection are necessary to prevent the development of nutritional deficiencies. Nutritional counseling has been associated with reduce HIV-related complications and delayed diseases progression, wich may improve quality of life and potentially decrease mortality in individuals with HIV. HIV patients should consume a healthy, balanced diet (Organization, 2023).

RESEARCH METHOD

The study was a cross-sectional design. This study involved 99 HIV patients who receive outpatient treatment at the Kanca Sehati Polyclinic, Dr H Abdul Moeloek Hospital, who were determined by consecutive sampling. The dependent variable is nutritional status and the independent variable is the characteristics of HIV patients and nutritional intake. Nutritional status is determined by calculating Body Mass Index (BMI), characteristics of HIV patients are colected from medical records and interviews, while nutritional intake is colected by interview using SQ FFQ (Semi Quantitative Food Frequency) 1 week previously which is processed using nutrisurvey software. Energy requirements are calculated by Mifflin formula considering the metabolic stress of HIV patients. Protein requirement is 1.2 g/kg of body weight/day (Cheah, 2024). Data were analyzed using the chi square test to determine factors associated to nutritional status

RESULTS AND DISCUSSIONS

Participants Characteristics

The population is HIV outpatients at Kanca Sehati Polyclinic Dr Hi Abdul Moeloek Hospital with total 410 patients. The number of study participants was 99 people who were determined using consecutive sampling, provided that the participants were aged 17 - 75 years, and were willing to become participants in the study according to the study stages.

Table 1. Caracteristics participants

Caracteristics Gender	n	Persentage (%)
- Male	73	73,73
- Female	26	26,27
Age		
- ≤ 20 years old	2	2,02
- 21 - 30 years old	39	39,39
- 31 – 40 years old	39	39,39
- 41 -50 years old	15	15,15
- > 50 years old	4	4,05
Education		
- Primary school	8	8,08
- Secondary school	61	61,61
- College	30	30,31
Ocupation		
- Unemployed	25	25,25
- Public Servant	3	3,03
- Private sector employed	25	25,25
- Self-employed & entrepreneur	29	29,29
- Farmer and laborer	10	10,10
- College student	7	7,08
Lama Minum Obat		
- < 1 year	50	50,50
- 1 – 5 year	40	40,40
- > 5 year	9	9,10
Jenis Obat yang dikonsumsi		
- Pre-ART	3	3,33
- ART	56	56,56
- ART+ antibiotic/vitamin	40	40,11
Gastrointestinal disorder		
- No	12	12,12
- Yes	80	87,88
Nutritional status		
- Underweight (IMT<18.5 kg/m²)	27	27,27
- Normal (IMT: 18,5 – 25 kg/m²)	59	59,59
- Overweight (IMT >25 kg/m²)	13	13,14
Energy intake		
- <90% requirement (Defisit)	37	33.37
- 90-119% requirement (Normal)	33	33.33
- ≥120% requirement (excessive)	29	29.30
Protein intake		
- <1.2 g/kg of body weight/day	54	54.55
- 1.2 – 1.5 g kg of body weight/day	29	29.29
- 1.5 g/kg of body weight/day	16	16.16
Total	99	100.00

Table 1. The study involved 74 male and 26 female participants, with the largest age range being 21 - 40 years (78.78% of total participants). The majority of participants had a secondary education (61.61%), and the most common occupation was self-employment (29.29%). Of the participants, 50.50% were on ART medication for less than 1 year. A total of 96.67% of participants received ART treatment, while 3.33% received antibiotics (pre-ART). Additionally, 12.12% of participants had gastrointestinal disorders. In terms of nutritional status, 27.27% of participants were categorized as underweight, and 13.14% were classified as overweight.

Table 2. Average characteristics

Caracteristis	Unit	Minimal	Maksimal	Mean	STD Deviasi
Age	years	18	67.00	32.95	9.32
IMT	kg/m²	12.5	29.40	20.81	3.71
Duration of ART treatment	years	0	20.00	1.98	3.52
Energi intake	%	37.42	189.04	104.68	33.63

Caracteristis	Unit	Minimal	Maksimal	Mean	STD Deviasi
Protein intake	%	35.20	272.70	102.68	47.57

The average age of the participants in the study was 32.95 years, with an age range spanning from 18 to 67 years. The participants' average body mass index (BMI) was found to be 20.81 kg/m², with a range from 12.5 kg/m² to 29.4 kg/m². In terms of ART medication usage, the average duration of taking the medication was determined to be 1.98 years, with a range from 0 years (one week) to 20 years. It was noted that three participants had not received ART treatment. Furthermore, the average energy intake was recorded as 104.68% ± 33.63%, with a range from 37.42% to 189.04%. Similarly, the average protein intake was measured to be 102.68% ± 47.57%, ranging from 35.2% to 272.7%.

Table 2 shows that the average age of participants is 32.95 years, with the highest age range being 25 – 40 years (78.78%), the lowest age of participants is 18 years and the highest age is 67 years. Data on the development of HIV disease in Indonesia in January - March 2023 shows that the age group 25 - 49 years is the highest group of HIV patients, namely 65.5% (Kemenkes, 2023). Lack of knowledge about HIV among teenagers can be the cause of them contracting HIV. Study on 109 teenagers aged 13 – 15 years showed that 75.2% of them had never received information about HIV/AIDS. Information about HIV/AIDS in adolescents was obtained during lessons at school (Kumalasary, 2021). (Kusdiyah et al., 2022) stated that as many as 53.7% of HIV patients had knowledge and attitudes about HIV/AIDS in the poor category. Age >45 years is a significant risk factor for death in HIV/AIDS patient (Kusumaadhi et al., 2021). To optimize HIV prevention in adolescents, it is necessary to provide education about HIV/AIDS by educational institutions, especially junior and senior secondary education providers.

The average age of participants is 32.95 years, with the highest age range being 25 - 40 years (78.78%), and the lowest age of participants being 18 years old, while the oldest participant was 67 years old. According to data on the development of HIV disease in Indonesia between January and March 2023, the age group 25 - 49 years old has the highest number of HIV patients, accounting for 65.5% (Kemenkes, 2023). Lack of knowledge about HIV among teenagers can be the cause of them contracting HIV. Research among 109 teenagers aged between 13 and 15 showed that 75.2% of them had never received information about HIV/AIDS. Information about HIV/AIDS among adolescents was acquired through schooling (Kumalasary, 2021). Kusdiyah et al. (2022) stated that 53.7% of HIV patients demonstrated inadequate knowledge and attitudes regarding HIV/AIDS. Kusumaadhi et al. (2021) pointed out that individuals aged 45 years and above are at greater risk for death due to HIV-related causes. To effectively prevent HIV amongst adolescents, it is crucial to provide education about HIV/AIDS, particularly by schools offering junior and senior secondary education.

Most of the participants in this study had a secondary education status, representing 61.61%. This is consistent with a previous study involving 235 HIV patients in Palembang, which revealed that the majority of participants had completed secondary school education, with senior high school education accounting for nearly half (48.9%) of the sample. Additionally, a retrospective study on 335 participants in Papua discovered that 45.7% of HIV patients had completed senior high school level education (48.7%) (Faot et al, 2024)

In relation to occupation, most participants in the study were self-employed (29.29%), with 7.07% being students. This occupation distribution differs from a study in Papua, where it was found that private employment was the most common occupation (24.9%), while students represented a smaller percentage. Students are a demographic with easy access to information about HIV/AIDS. As evidenced by a study on 250 students aged 16 to 23 years at UIN Sunan Ampel Surabaya, it was found that 58.4% of these students possessed inadequate knowledge about the causes, symptoms, prevention and transmission of HIV/AIDS (Widayanti et al., 2018).

Therapy for HIV patients involves the use of antiretroviral drugs (ART). This medication cannot cure HIV, but it can play a significant role in inhibiting HIV multiplication in the body, thereby increasing CD4 lymphocytes and improving the quality of life for HIV patients, thus reducing morbidity and mortality. With a stronger immune system and protection from opportunistic infections, people living with HIV/AIDS can lead healthy, productive lives and effectively carry out work (Kemenkes, 2019)(Ajmala & Wulandari, 2015). On average, participants in this study had been undergoing ART treatment for a period of 1.98 years. Of the total participants, 50 participants (50.5%) had been taking ARTs for less than 1 year. The findings of a study involving 67 HIV patients in Jambi diverged slightly from these results, with 76.1% of the participants having taken ART medication for more than 2 years (Kusdiyah et al., 2022). Adherence to ART treatment has a direct impact on the quality of life of HIV/AIDS patients.

The devastating impact of the HIV virus is most significant in its targeting of T lymphocyte (CD4+) cells, leading to a weakened immune system. This vulnerability leaves HIV patients highly susceptible to opportunistic infectious diseases such as tuberculosis, toxoplasmosis, and others (Helena et al., 2024). Preventative measures, in the form of both primary and secondary prophylaxis, can be taken to mitigate the risk of these infections. Primary prophylaxis aims to prevent infections that have not yet occurred, while secondary prophylaxis aims to protect against infections (Ajmala & Wulandari, 2015). The data obtained through this study indicate that a significant portion of participants (3.03%) had not received ART therapy (pre-ART), while 56.56% received ART therapy alone, and 40.41% took ARTs in combination with antibiotics or vitamins. A notable reason for the delayed start of ART therapy in 3.03% of participants was the discovery of an opportunistic infection at the time of HIV diagnosis, necessitating an initial 2-week treatment for the acute opportunistic infection (Swinkels et al., 2024).

The impact of gastrointestinal disorders on HIV patients can significantly affect their nutritional intake. According to study findings, 12.12% of participants experienced gastrointestinal disorders, manifesting in the form of nausea, vomiting, diarrhea, mouth ulcers, bloating or abdominal pain. The gastrointestinal complaints reported by participants could be an indication of opportunistic infections such as candidiasis and diarrhea, or a side effect of antiretroviral therapy (ART) medications. HIV infection is known to alter the composition of the intestinal microbiota, thereby contributing to the proliferation of pathogenic bacteria (Basile et al., 2021). Gastrointestinal disorders can also emerge as the negative consequences of ART drugs. Common side effects of ART in the form of nausea, vomiting, and diarrhea may occur during the initial weeks of ART therapy (Kemenkes, 2019). A retrospective study of 400 people living with HIV/AIDS who received ART therapy found that 30% experienced side effects from ART medications. Specifically, approximately 9% of participants reported experiencing gastrointestinal side effects (Sukmawan et al., 2022). The average calorie intake of participants in the research was 104.68% ± 33.63% of the suggested daily intake, with some individuals consuming as little as 37.42% of their required energy intake and others exceeding 189.04%. Approximately 33.37% of participants consumed an amount of calories less than 90%, while 29.30% consumed more than 120% of their daily recommendation. The primary cause for low calorie intake was cited as gastrointestinal disorders, presenting as nausea, vomiting, mouth ulcers or diarrhea. Additionally, it was noted that a majority of participants who consumed excessive amounts of calories also consumed an excess of proteins. Insufficient calorie intake leads to muscle wasting, loss of lean body mass, and unintentional weight loss, thereby contributing to increased illness severity and mortality in HIV patients (Obeagu et al., 2024). Protein is vital for the development of immune cells and plays a pivotal role in immune system modulation. Consuming food sources enriched with protein, such as lean meats, dairy products, legumes, and nuts, can provide the essential amino acids necessary for the proliferation of immune cells. Optimal protein intake can also help preserve muscle mass, supporting immune function (Obeagu et al., 2024). According to the study results, the average protein intake among participants was 102.68% ± 47.57% of the recommended requirement.

Interestingly, 54.55% of participants reported a daily protein intake of less than 1.2 g/kg BW/day. This insufficient intake may lead to immune system suppression, as evidenced by CD4<500 cells/mm3 levels. Alarmingly, HIV patients with low protein intake are estimated to be 3,036 times more likely to experience a decrease in CD4<500 cells/mm3 compared to those with adequate protein intake (Maragareth et al., 2019).

Association Between Characteristics and Nutrition Intake with Nutritional Status

The results of the Chi-square test indicated a significant association between occupation and medication type with the nutritional status of the participants, with p values of 0.003 and 0.015, respectively. Specifically, the study found that participants with employment in the farming, labor, and student categories were 4.7 times more likely (95% CI: 1,610 - 13,754) to have a BMI below 18.5 kg/m² compared to those in the civil servant/employee/entrepreneur/not working (housewives) category. Furthermore, gender, age, education, occupation, duration of ART use, energy intake, and protein intake did not show a significant association with the participants' nutritional status. The risk of being underweight among males was found to be 1,812 times higher (95% CI: 0.606 - 5.421) compared to females. Individuals under 25 years old had a risk that was 2,105 times higher (95% CI: 0.750 - 5.913) compared to those aged 25 and older. The study revealed that laborers, farmers, and students had a risk that was 4,706 times higher (95% CI: 0.606 - 5.421) of having a BMI of less than 18.5 kg/m², compared to civil servants/employees/entrepreneurs/not working (housewives). Furthermore, participants taking ART for less than 1 year had a risk of 1,626 times being underweight (95% CI: 0.606 - 5.421) compared to those taking ART for a year or more. In addition, protein intake less than 1.2 g/kg of body weight was found to carry a risk of 1,905 times (95% CI: 0.778 - 4,663) of having a BMI lower than 18.5 kg/m² when compared to those with intake of 1.2 g/kg BW or more.

Malnutrition is a common complication of HIV, which can accelerate disease progression, increase illness severity, and negatively impact survival in HIV/AIDS patients (World Health Organization, 2023). It often occurs in advanced stages of the condition (Anderson et al., 2017).

Malnutrition in HIV patients is a pervasive health issue that requires immediate attention, as it can lead to various physiological, functional, and psychological disturbances. Malnutrition impairs the immune system, thereby accelerating the progression of the disease (Birhane et al., 2021). The nutritional status of HIV patients is closely associated with their quality of life (Anderson et al., 2017), as it impacts mortality rates (Amelia, 2021). Insufficient nutritional status in HIV patients can raise their viral load, make them more vulnerable to infections, and increase the risk of transmitting the virus both sexually and vertically (Tesfay et al., 2022).

Table 3. Association between characteristics and nutrition intake with nutritional status

Caracteristics	IMT (kg/m²)				Total		OR	95% CI	p
	< 18,5	%	≥ 18,5	%	n	%			
Seks									
- Male	22	30.1	51	69.9	73	100	1.812	0.606 – 5.421	0.284
- Female	5	19.2	21	80.8	26	100	1		
Age									
- < 25 years old	8	40.0	12	60.0	20	100	2.105	0.750 – 5.913	0.153
- ≥ 25 years old	19	24.1	60	75.9	79	100	1		
Education level									
- Primary school	4	50.0	4	50.0	8	100	4.167	0.575 - 21.64	0.213
- Secondary school	17	28.3	43	71.7	60	100	1.647		
- College	6	19.4	25	80.6	31	100	1		
Pekerjaan									
- Laborer/farmer/college student	10	55.6	8	44.4	18	100	4.706	1.610 – 13.754	**0.003**
- Unemployed/Public servant/ Private sector employed/self-employed	17	21.0	64	79.0	81	100	1		

Duration of ART treatmen									
- < 1 year	16	32.0	34	68.0	50	100	1.626	0.663 – 3.984	0.286
- ≥ 1 year	11	22.4	38	77.6	49	100	1		
Type of drug treatmen									
- Pre-ART	3	100.0	0	0	3	100	4.444	0.488 – 7.900	**0.015**
- ART	15	26.8	41	73.2	56	100	1.260		
- ART+antibiotic/vit	9	22.5	31	77.5	40	100	1		
Gastrointestinal disorder									
- Yes	3	25.0	9	75.0	12	100	1.143	0.285 – 4.582	0.850
- No	24	27.6	63	72.4	87	100	1		
Asupan energy									
- Defisit	11	29.7	26	70.3	37	100	1.330	0375 – 4.013	0.880
- Normal	9	27.3	24	72.7	33	100	1.179		
- Excessive	7	24.1	22	75.9	29	100	1		
Asupan protein									
- <1.2 g/kg of BW/day	14	35.0	26	65.0	40	100	1.905	0.778 - 4.663	0.155
- ≥1.2 g/kg of BW/day	13	22.0	46	78.0	59	100	1		
TOTAL	27	27.3	72	72.7	99	100			

Malnutrition is a significant complication of HIV infection, and it plays a crucial role in the development of AIDS (Sivakumar & Vanaja, 2021). It has been observed that malnutrition can accelerate disease progression, increase illness burden, and decrease survival in HIV/AIDS patients (World Health Organization, 2023). Interestingly, malnutrition tends to manifest in the advanced stages of HIV infection (Anderson et al., 2017).

Malnutrition in HIV patients is a complex health issue that warrants attention as it can have profound effects on the patient's overall well-being, leading to physiological, functional, and psychological disturbances (Birhane et al., 2021). The nutritional status of HIV patients is closely linked to their quality of life (Anderson et. al, 2017) and even mortality rates (Amelia, 2021). Insufficient nutrition has been shown to increase viral load, render individuals more susceptible to infections, and elevate the risk of both sexual and vertical transmission of HIV (Tesfay et. al., 2022).

Table 2 reveals that the average BMI of participants was 20.81 kg/m², with the lowest BMI being 12.5 kg/m² and the highest BMI being 29.4 kg/m². The prevalence of underweight was relatively high in this study, as 27 participants (27.27%) were found to be underweight (BMI < 18.5 kg/m²) while 13 participants (13.13%) were overweight. The prevalence of malnutrition in HIV patients at Dilla Hospital, Ethiopia was 25.2% (Birhane, M; Loha, E & Alemayehu, 2021). A study in Nepal showed that 19.9% of HIV patients were underweight and 9.7% were overweight (Thapa et al., 2015). Underweight is caused by increased metabolic rate, increased energy expenditure, chronic inflammation (Obeagu et al., 2024), inadequate nutritional intake or poor absorption (Rezazadeh et al., 2023). The nutritional status of HIV patients is an important factor that needs attention because it is related to the quality of life of HIV patients (Thapa et al., 2015). Specifically, it impacts the physical, emotional, pain, vitality, and mental well-being domains (Anderson et al., 2017). Additionally, nutritional status is linked to mortality in children with HIV / AIDS (Amelia, 2021). The risk of underweight can be reduced through nutritional education (Saliya et al., 2018).

Table 3 indicates a significant relationship between the nutritional status of HIV patients and the type of work (p = 0.003). The type of work influences income and socio-economic status. An increase in family income correlates with an increase in food expenditure (Saputri et al., 2015). Socio-economic factors affect a person's food choices (Obeagu et al., 2024) which in turn affects nutrient intake. Ultimately, the nutritional intake affects nutritional status. In this study, HIV patients with the occupation of laborer/farmer/college student were found to be at high risk (95% CI: 1,610 - 13,754) of being underweight (BMI <18.5 kg/m2) compared to those with high socio-economic status and sedentary jobs like civil servants, employes, and self-employed & entrepreneurs/not working (housewives). This study reveals that the duration of ART (antiretroviral therapy) treatment was not associated with the nutritional status of HIV patients (p=0.286) (Table 3). Surprisingly, HIV patients taking ART for less than 12 months had an 1.87

times higher risk of having underweight nutritional status compared to those who had taken ART for 12 months or more. Previous research has suggested that ART (antiretroviral therapy) initiation can lead to metabolic disturbances and negative effects on nutritional status, especially during the first few months of treatment due to symptoms such as nausea, vomiting, or reduced bone mineral density (Abate et al., 2020). However, ART treatment for more than 6 months has been found to improve children's nutritional status based on weight-based age (WAZ) indicators (Ratnasari et al., 2023). In addition, the duration of ART treatment in children can also improve their height-based age (HAZ) (Dahliyanti et al., 2022). The most crucial factor in ART (antiretroviral therapy) treatment is patient adherence to taking ART is closely linked to nutritional status and CD4 cell numbers in children with HIV (Dahliyanti et al., 2022).

This study strongly associates the type of drug treatment with the nutritional status (p = 0.015). HIV patients who have not received ART (pre-ART) therapy face 4.444 times higher risk of being underweight compared to those who went to college. Research has shown that HIV patients who have not received ART therapy are prone to weight loss due to hypermetabolic conditions that can lead to cachexia. Additionally, the risk of a poor nutritional status is 2.09 times higher in HIV patients who do not receive cotrimoxazole prophylaxis therapy, as compared to those who receive it (Oumer et al., 2019). ART therapy can help improve the body's weakened immunity as a result of an infection (de Souza et al., 2022). These findings underscore the significant impact of treatment on the nutritional status of HIV patients.

HIV infection raises the body's energy needs (Rezazadeh et al., 2023). Proper energy intake plays a crucial role in enhancing the body's response to medication and minimizing ART side effects (Sivakumar et. Al, 2021). In this study, 33 participants (33.37%) fell into the energy deficiency category. Low energy intake is often caused by digestive issues, including mouth ulcers, diarrhea, and vomiting, and is also linked to ART side effects. Insufficient energy intake in HIV patients may also stem from the metabolic consequences of malnutrition or psychological factors like lacking social support low self-esteem and insufficient access to food. Insufficient energy intake may lead to nutritional problems, including malnutrition (Cheah, 2024).

HIV patients who suffer from malnutrition can experience physiological, functional and psychological disorders. Malnutrition also leads to a decreased immune system and the worsening of the HIV disease. Proper intake of nutrients, which include both macronutrients and micronutrients, is critical for improving immunity, maintaining nutritional status, slowing the progression of HIV disease, and enhancing the quality of life (Rezazadeh et. Al, 2023). Early nutritional counseling and support are essential in the early stages of HIV infection to prevent nutrient deficiencies. By providing nutritional counseling, HIV-related complications can be lessened, the progression of the infection can be slowed, ultimately improving the quality of life and reducing mortality from HIV (WHO, 2023). This highlights the important role of adequate and balanced nutrient intake in managing HIV infections and improving the overall health and well-being of individuals infected with HIV.

Table 3 demonstrates that there is no association between protein intake and the nutritional status of HIV patients (p = 0.155). Patients with protein intake of less than 1.2 g/kg BW/day have a 1.905 times higher risk of being underweight (95% CI: 0.778 - 4.663). A study conducted on HIV children in Semarang found that there was no correlation between protein intake and nutritional status, but a significant link between protein intake and CD4 counts (Maragareth et al., 2019). High CD4 counts improve the quality of life for HIV patients (Daramatasia & Soelistyoningsih, 2019). Therefore, adequate protein intake shoul (Daramatasia & Soelistyoningsih, 2019) d be the aim for HIV patients. However, excess protein and L-lysine intake can increase the risk of HIV replication, accelerate immunosuppression, and further the progression of disease (Vlad. Butorov, 2017).

CONCLUSION

The nutritional status of HIV patients is influenced by their occupation and drug therapy type. However, gender, age, education, duration of ART treatment, presence of digestive disorders, energy, and protein intake do not affect the nutritional status of HIV patients. The risk of being underweight in men is 1.812 times higher than that of women. Individuals aged <25 years old have a 2.105 higher risk of being underweight. Those with lower educational background face a 4.167 higher risk compared to individuals with tertiary education. Laborers, farmers, and students have a 4.706 times higher risk compared to civil servants, employees, entrepreneurs, and the unemployed. HIV patients who have received ART treatment for less than 1 year are at a 1.626 higher risk. Individuals not receiving ART therapy are at a 4.444 times higher risk compared to those receiving ART+ antibiotic/vitamin treatment. Additionally, a protein intake of less than 1.2 g /kg BW/day increases the risk of being underweight by 1.905 times. Improving the energy and protein intake of HIV patients can be achieved through nutritional counseling.

References

Abate, B. B., Aragie, T. G., & Tesfaw, G. (2020). Magnitude of underweight, wasting and stunting among HIV positive children in East Africa: A systematic review and meta-analysis. *PLoS ONE*, *15*(9 September), 1–22. https://doi.org/10.1371/journal.pone.0238403

Ajmala, I., & Wulandari, L. (2015). Terapi ARV pada Penderita Ko-Infeksi TB-HIV. *Jurnal Respirasi*, *1*(1), 22–28.

Amelia, E. R. (2021). Hubungan status gizi terhadap kematian anak HIV/AIDS. *Jurnal Medika Hutama*, *2*(04 Juli), 1241–1244.

Anderson, K., Pramudo, S. G., & Sofro, M. A. U. (2017). Hubungan status gizi dengan kualitas hidup orang dengan HIV/AIDS di Semarang. *Jurnal Kedokteran Diponegoro (Diponegoro Medical Journal)*, *6*(2), 692–704.

Basile, F. W., Fedele, M. C., & Lo Vecchio, A. (2021). Gastrointestinal Diseases in Children Living with HIV. *Microorganisms*, *9*(8), 1572.

Birhane, M., Loha, E., & Alemayehu, F. R. (2021). Nutritional status and associated factors among adult HIV/AIDS patients receiving ART in Dilla University referral hospital, Dilla, Southern Ethiopia. *J Med Physiol Biophys*, *70*, 8–15.

Cheah, J. K. (2024). Nutrition Requirements and Nutrition Intervention for People Living with HIV/AIDS (Adults). *Journal of Health and Allied Sciences NU*.

Dahliyanti, N., Khairiah, R., & Murtiani, F. (2022). Hubungan Kepatuhan Antiretroviral Therapy Dengan Status Gizi Dan Kadar CD4 Pada Anak HIV/AIDS. *Jurnal Kesehatan Komunitas (Journal of Community Health)*, *8*(2), 247–256.

Daramatasia, W., & Soelistyoningsih, D. (2019). HUBUNGAN JUMLAH CD4 DENGAN KUALITAS HIDUP PADA ORANG DENGAN HIV/AIDS (ODHA). *Jurnal Ilmiah Kesehatan Media Husada*, *8*(1), 41–52.

de Souza, R. G., Lima, S. S., Pinto, A. C., Souza, J. S., Moura, T. C. F., da Silva Graça Amoras, E., Machado, L. F. A., Guerreiro, J. F., Vallinoto, A. C. R., & Queiroz, M. A. F. (2022). Change in nutritional and biochemical status in people living with HIV-1 on antiretroviral therapy. *Viruses*, *14*(11), 2573.

Framasari, D. A., Flora, R., & Sitorus, R. J. (2020). Infeksi Oportunistik pada ODHA Terhadap Kepatuhan Minum ARV di Kota Palembang. *JAMBI MEDICAL JOURNAL "Jurnal Kedokteran Dan Kesehatan,"* *8*(1), 67–74.

Grieshaber, S. (2020). Equity and research design. In *Doing early childhood research* (pp. 177–191). Routledge.

Indrawanti, R., Arguni, E., Laksanawati, I. S., Puspitasari, D., & Husada, D. (2021). Status gizi dan gambaran klinis penyakit pada pasien HIV anak awal terdiagnosis. *Jurnal Gizi Klinik Indonesia*, *17*(3), 125–132.

Kemenkes. (2022). Perkembangan HIV AIDS dan Penyakit Infeksi Menular Seksual (PIMS) Triwulan II Januari-Juni Tahun 2022. Kementrian Kesehatan RI. In *Kemenkes* (pp. 4247608(021), PP. 1-30).

Kemenkes, D. P. (2023). Laporan Eksekutif Perkembangan HIV AIDS Dan Penyakit Infeksi Menular Seksual (PIMS) Triwulan I Tahun 2023. In *Siha.kemkes.go.id* (pp. 1–15). https://siha.kemkes.go.id/

Kemenkes, R. I. (2019). Pedoman Nasional Pelayanan Kedokteran Tata Laksana HIV. *Jakarta. Kementrian Kesehatan Republik Indonesi*.

Khatri, S., Amatya, A., & Shrestha, B. (2020). Nutritional status and the associated factors among people living with HIV: an evidence from cross-sectional survey in hospital based antiretroviral therapy site in Kathmandu, Nepal. *BMC Nutrition*, *6*, 1–13.

Kumalasary, D. (2021). Pengetahuan Remaja Tentang HIV/AIDS. *Midwifery Journal*, *1*(2), 101–106.

Kurniawati, D. N., Iqbal, M., Septiana, A. S., Ciptaningrum, D. S., Sholihah, L., & Retanubun, Y. T. (2021). CRITICAL MEDICAL AND SURGICAL Principles of Providing Nutrition to People Living with HIV / AIDS : A. *Critical Medical and Surgical Nursing Journal*, *10*(2), 61–64

Kusdiyah, E., Rahmadani, F., Nuriyah, N., & Miftahurrahmah, M. (2022). Faktor-Faktor Yang Berhubungan Dengan Kepatuhan Pasien HIV Dalam Mengonsumsi Terapi Antiretroviral Di Puskesmas Simpang Kawat Kota Jambi. *Electronic Journal Scientific of Environmental Health And Disease*, *3*(1), 8–27.

Kusumaadhi, Z. M., Farhanah, N., & Sofro, M. A. U. (2021). Risk factors for mortality among HIV/AIDS patients. *Diponegoro International Medical Journal*, *2*(1), 19–20.

Maragareth, W., Hadisaputro, S., & Margawati, A. (2019). The correlation between intake of energy, protein, fat of underweight and CD4+ count for children with HIV. *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, *6*(2), 77–87.

Obeagu, E. I., Obeagu, G. U., & Okwuanaso, C. B. (2024). Optimizing Immune Health in HIV Patients through Nutrition: A Review. *Elite Journal of Immunology*, *2*(1), 14–33.

Organization, W. H. (2023). *Carbohydrate intake for adults and children: WHO guideline*. World Health Organization.

Oumer, B., Boti, N., Hussen, S., & Gultie, T. (2019). Prevalence of Undernutrition and associated factors among adults receiving first-line antiretroviral treatment in public health facilities of Arba Minch town, southern Ethiopia. *HIV/AIDS-Research and Palliative Care*, 313–320.

Perpetue, F. F. D., Charles, K. T., & Anatole, P. C. (2021). Nutritional Assessment of HIV/AIDS patients in Centre Region of Cameroon: A pilot study. *Journal of Food Science and Nutrition Research*, *4*(2), 77–93.

Ratnasari, L. P. A. P., Suryawan, I. W. B., & Dewi, M. R. (2023). Faktor-faktor yang berhubungan dengan status gizi anak HIV/AIDS di Rumah Sakit Umum Daerah Wangaya. *Intisari Sains Medis*, *14*(2), 922–926.

Rezazadeh, L., Ostadrahimi, A., Tutunchi, H., Naemi Kermanshahi, M., & Pourmoradian, S. (2023). Nutrition interventions to address nutritional problems in HIV-positive patients: translating knowledge into practice. *Journal of Health, Population and Nutrition*, *42*(1), 94.

Rosa YA faot, July Ivone, L. K. (2024). *Characteristics of HIV Patients in Mimika Regency Papua in 2019*. *6*(1), 1–11.

Saliya, M. S., Azale, T., Alamirew, A., & Tesfaye, D. J. (2018). Assessment of nutritional status and its associated factors among people affected by human immune deficiency virus on antiretroviral therapy: a cross sectional study in Siltie zone, south Ethiopia. *Healthcare in Low-Resource Settings*, *6*(1).

Saputri, D. E., Bakri, S., & Zuraida, R. (2015). Peranan sistem repong damar terhadap pendapatan, asupan makan dan status gizi balita: studi kasus di Desa Pahmungan Kecamatan Pesisir Tengah Kabupaten Pesisir Barat. *Jurnal Sylva Lestari*, *3*(1), 63–70.

Sitorus, R. J., Camelia, A., Maryatun, S., Aerosta, D., & Natalia, M. (2022). Kondisi Klinis dan Determinan Status Gizi Anak dengan HIV/AIDS (ADHA). *Jurnal Kesehatan*, *13*(3), 479–484.

Sivakumar, T., & Vanaja, P. (2021). Relationship between HIV and nutrition. *HIV Nursing*, *21*(02), 68–72.

Sukmawan, Y. P., Putrinda, I. O., & Nurviana, V. (2022). Evaluasi Penggunaan Obat dan Efek Sampingnya pada Penderita HIV/AIDS di Salah Satu Rumah Sakit di Kota Tasikmalaya. *Prosiding Seminar Nasional Diseminasi Hasil Penelitian Program Studi S1 Farmasi*, *2*(1).

Swinkels, H. M., Vaillant, A. A. J., Nguyen, A. D., & Gulick, P. G. (2024). HIV and AIDS. In *StatPearls [Internet]*. StatPearls Publishing.

Tesfay, F. H., Javanparast, S., Gesesew, H., Mwanri, L., & Ziersch, A. (2022). Characteristics and impacts of nutritional programmes to address undernutrition of adults living with HIV in sub-Saharan Africa: a systematic review of evidence. *BMJ Open*, *12*(1), e047205.

Thapa, R., Amatya, A., Pahari, D. P., Bam, K., & Newman, M. S. (2015). Nutritional status and its association with quality of life among people living with HIV attending public anti-retroviral therapy sites of Kathmandu Valley, Nepal. *AIDS Research and Therapy*, *12*, 1–10.

Vlad. Butorov, E. (2017). Impact of high protein intake on viral load and hematological parameters in HIV-infected patients. *Current HIV Research*, *15*(5), 345–354.

WHO. (2024). HIV and AIDS Key Facts. *World Health Organization*, *86*(july), 1–7. https://www.who.int/news-room/fact-sheets/detail/hiv-aids

Widayanti, L. P., Hidayati L, S., Lusiana, N., & Ratodi, M. (2018). Hubungan pengetahuan tentang HIV/AIDS dan sikap mahasiswa terhadap ODHA-The correlations between student's HIV/AIDS knowledge and their attitude toward PLWHA. *Journal of Health Science and Prevention*, *2*(2), 100–107.

Windiramadan, A., Carsita, W., & S, R. (2024). Hubungan Kepatuhan Minum Obat ARV dengan Kualitas Hidup Orang dengan HIV/AIDS ARV dan kualitas hdp.pdf. *Jurnal Keperawatan Surabaya*, *11*(1), 1–7.