Immunotherapy: Open Access

OPEN ACCESS Freely available online

Research Article

Dietary Diversity Practice and its Associated Factors Among Adult People Living with HIV Who go to Health Facilities in Ilu Abbabor Zone, South West Ethiopia: A Facility-Based Cross-Sectional Study

Ebissa Negera*, Tefera Belachew, Kalkidan Hassan

Department of Nutrition and Dietetics, Institute of Health, Jimma University, Ethiopia

ABSTRACT

Objective: The current study aimed to assess dietary diversity practice and its associated factors among adult ART patients in Ilu Abbabor Zone, South West, Ethiopia.

Methods: A facility-based cross-sectional study was conducted in six different health care facilities. Epi-Data was used for data entry, and SPSS version 21 was used for analysis. The level of significance in the final model was set at (P<0.05).

Results: The current study found that the majority of respondents (61.2%) had an inadequate dietary diversity practice. Adults on ART, on the other hand, have adequate dietary diversity practice.

On the other hand, dietary diversity practice of adult people on ART, significantly associated with; being ever married (AOR=0.366; 95% CI: (0.211, 0.634)), household number >/=5 (AOR=2.45; 95% CI: (1.522, 4.088)), clinical stage of disease (AOR=2.474; 95% CI (1.124, 5.444), and obesity (AOR=0.290; 95% CI: (0.099, 0.846)).

Conclusion: The vast majority of study subjects (61.2%) had an inadequate dietary diversity practice. Furthermore, the adequacy of adult ART dietary intake was significantly related to marital status, household number, clinical stage of disease, and nutritional status. As a result, unmarried adult people living with HIV/AIDS must receive care and support. It is strongly advised to integrate nutrition with RH services, particularly family planning. Finally, early HIV/AIDS diagnosis and management, as well as nutrition, are critical for delaying the rapid progression of HIV to Acquired Immune Deficiency Syndrome (AIDS).

Keywords: Dietary diversity; Adult people; Anti-retroviral treatment

INTRODUCTION

Dietary diversity is a quantitative number of food groups that is widely used to determine diet variety and nutrient adequacy. It is the total number of food groups consumed over a given time period. Diversified diets that include foods from various food groups provide a balance of nutrients that promote growth and development. It is unquestionably linked to nutrient sufficiency [1]. Unhealthy diets and malnutrition are global public health concerns, particularly in developing countries [2]. Chronic patients, including HIV/AIDS, are at high risk in developing countries with high nutrient demands due to the consumption of low-quality, monotonous food, which leads to nutrient deficiencies [3]. HIV/AIDS and malnutrition are both widespread in many parts of the world. The effects are interconnected and exacerbate each other in a vicious cycle [4]. Both HIV and malnutrition can cause progressive immune system damage and increased susceptibility to infections *via* opportunistic infections. HIV specifically impacts nutritional status by increasing energy requirements, decreasing food intake, and impairing nutrient absorption and metabolism [5].

A non-diversified diet can harm an individual's health by reducing physical, social, cognitive, reproductive, and immunological dimensions [6]. Adult PLW HA's dietary intake adequacy is critical to improving their quality of life [7]. The problem of dietary diversity in Ethiopia occurs at all times of the year. The number of relief-dependent populations has risen over time, indicating that famine has become more common.

Correspondence to: Ebissa Negera, Department of Nutrition and Dietetics, Institute of Health, Jimma University, Ethiopia, E-mail: ebissanegera@yahoo.com

Received: 24-Apr-2023, Manuscript No. IMT-23-23716; **Editor assigned:** 27-Apr-2023, PreQC No. IMT-23-23716 (PQ); **Reviewed:** 11-May-2023, QC No. IMT-23-23716; **Revised:** 18-May-2023, Manuscript No. IMT-23-23716 (R); **Published:** 25-May-2023, DOI: 10.35248/2471-9552.23.09.224.

Citation: Negera E, Belachew T, Hassan K (2023) Dietary Diversity Practice and its Associated Factors Among Adult People Living with HIV Who go to Health Facilities in Ilu Abbabor Zone, South West Ethiopia: A Facility-Based Cross-Sectional Study. Immunotherapy (Los Angel). 9:224

The number of relief-dependent populations has risen over time, indicating that famine is becoming more common and even worsening food diversity issues [8].

If appropriate measures are not taken, the terrible nature of HIV will have a negative impact on the country's economic activities [9]. The Ethiopian food diversity problem stems directly from reliance on an undiversified (monotonous) diet, insufficient income, low-output-fed agriculture, and awareness issues [10,11]. Using a diverse diet to determine dietary intake adequacy among adult PLW HA is still poor in resource-limited African nations. According to studies conducted in Kenya, Rwanda, Nigeria, and Uganda, 43 to 62.3% of PLW HA had low dietary diversity [12-15].

Studies conducted in Rwanda, Uganda, Nigeria and Kenya; on the other hand, show that educational status, economic status, mental health status, physical health status, and nutritional counseling are all related to dietary diversity [12,15,16].

According to research conducted in Ethiopia, the magnitude of inadequate dietary diversity among adult PLW HA ranged from 28.7% to 71%. Income or wealth status, occupational status, educational status, marital status, media exposure in the home, nutritional counseling, ART duration, and use of cotrimoxazole prophylaxis were found to have a significant relationship with dietary diversity practice [2,14,17-19].

Ethiopia has made a significant effort to address the impact of HIV/AIDS on nutrition by developing national HIV/AIDS guidelines and implementing measures to provide quality care and support to people living with the disease [20]. In addition to HIV/AIDS treatment, care, and support, they provided livelihood support and food assistance, as well as strengthened community-based nutrition care and support activities for PLH IV through health extension workers, agriculture extension workers, and health development armies [21,22].

A diverse diet, on the other hand, is a serious, unmanageable problem for 29.5% of adults living with HIV/AIDS [17]. However, there is insufficient data on the effects of a monotonous diet on PLH IV in Ethiopia, including the study setting [17,19].

To the best of the researchers' knowledge, no study on dietary diversity practice among PLW HA had been conducted in the study area. Furthermore, a few studies conducted in Ethiopia used nine food groups to assess dietary diversity practice. However, in this study, twelve food categories were used to determine dietary diversity practice. The researchers believe that increasing food categories are more appropriate for measuring dietary diversity practice than decreasing food categories. As a result, the purpose of this study was to determine the extent of dietary diversity practice and its associated factors among HIV-positive adults on ART who attended public health facilities in Ilu Abbabor Zone, South West, Ethiopia.

MATERIALS AND METHODS

The study area, the study design, and the study period

A facility-based cross-sectional study of adult PLHA in Ilu Abba Bor Zone, Southwest Ethiopia, was conducted from January to March 2020. The Ilu Abba Bor Zone is located 600 kilometers from the country's capital. The Zone is divided into 14 districts, 13 of which are rural and one of which is administrative. The zone's total population was estimated to be 934,783, with 153,585 children under the age of five and 100,209 children aged two to five. It is located in the western part of the area at 70 27'40"N to 90 02'10" N latitude and 340 52'12"E to 410 34'55" longitude.

The zone has three major climatic zones: temperate rainy, rainy, and dry arid. In the zone, rain falls twice a year. The highest annual rainfall total is approximately 2400 mm, and the lowest annual rainfall total is approximately 100 mm. The highest mean annual temperature in most highland areas of Ilu Abbabor ranges from 26°C to 10.6°C.

Sample size estimation and sampling technique

A G-Power model with the following assumptions was used to calculate sample size: The estimated prevalence of inadequate dietary diversity among adult PLW HA is 28.7%, with a 2.26 odds ratio, 80% power, and a 5% margin of error. As a result, n=320 is calculated as the sample size. The 20% non-response rate was then considered. Finally, 384 people were included in the sample.

The researchers used a simple random sampling technique to identify health facilities. At the first stage, 15 health facilities were identified as currently providing an ART service. Six of them were chosen using a simple random sampling technique. Finally, a simple random sampling technique was used to select study participants while keeping proportionality in mind.

Criteria for eligibility

Criteria for inclusion: The study only included adult PLW HA over the age of fifteen.

Criteria for exclusion: Patients who were unable to respond due to illness, had unusual previous 24-hour meals, had previously diagnosed diabetes mellitus and hypertension, and were currently pregnant were excluded.

Patient and public involvement: The current study's design, management, and execution included patients and members of the public. Adult people on ART provided feedback on the design of the study's materials, as well as management oversight through opinion and community leaders. The research team thoroughly considered the potential hardship of volunteers. We want to share the key findings with the participants and will enlist the help of the public and patients in developing a suitable distribution strategy.

Methods and procedures for data collection

A structured interviewer questionnaire was used to collect data. A questionnaire was used to collect socio-demographic information such as gender, age, ethnicity, religion, and occupation. Reviewing patient clinical records yielded information on health and behavioral characteristics such as ART duration, Cotrimoxazole prophylaxis, last (current) CD4 count, WHO clinical stage, and opportunistic infections. The Food and Agriculture Organization's (FAO) 2007 Individual Dietary Diversity Score (IDDS) was used to assess the standardized Individual Dietary Diversity Score (IDDS).

Dietary diversity score measurement

Dietary diversity scores are based on a simple count of the food groups consumed by a house hold or an individual in the previous 24 hours [23].

Because determining nutrient adequacy in the diet is the primary goal of the study, data were gathered at the individual level. The dietary diversity score was calculated primarily by listing all food items consumed by respondents (both at home and away from home) in the previous 24 hours, beginning with breakfast (between 6:00 am and 10:00 am), then lunch (12:00 am-4:00 pm), and dinner (8:00 pm-12:00 am), with snacks eaten before or after the main meal.

Foods eaten by respondents were classified into 12 food groups based on the Food and Agriculture Organization (FAO)/Food and Nutrition Technical Assistance Project (FANTA) 2007 recommendation: cereals, oils/fats, sweets/sugar, legumes, white root and tubers; fruits, vegetables, meat and meat products, milk and milk products, eggs, fish and seafoods, and spices, condiments, and beverages. Participants received one point if they consumed any of the foods in each subgroup at least once in the previous 24 hours, and zero points if they did not consume the food.

The IDDS was calculated by adding the food groups consumed over a 24-hour period. The total individual food scores were first divided into terciles, with low IDDS corresponding to low dietary diversity (1-3 food groups), medium IDDS corresponding to 4-5 food groups, and high IDDS corresponding to 6 or more food groups. These groups were then dichotomized into two categories for further analysis, with 0-4 being considered inadequate dietary intake and 5 or more food groups being considered adequate dietary intake [2].

Data validation, processing, and analysis

Structured questionnaires, standardized IDDS, and a 24-hour dietary recall tool were used to maintain data quality. To maintain consistency for actual data collection, the English version of the questionnaire was translated into the local language (Afaan Oromoo) and then back to English. The questionnaire was also pretested on health facilities other than those involved in the study. Data collectors (six clinical nurses) and three supervisors received two days of training. Furthermore, the investigators provided feedback and corrections to the data collectors on a daily basis. The collected data was thoroughly examined for completeness, accuracy, and clarity.

The data was coded and entered into Epi-data version 3.1 before being exported to the Statistical Package for Social Science (SPSS) version 20.0 for analysis. Percentages of respondents were calculated for food groups and the number of meals eaten by each respondent in a 24-hour recall period. Cross-tabulations were used to test the relationship between respondent characteristics and dietary diversity score, which is represented by the total number of food groups consumed by each respondent in the 0-4 and 5+ categories.

The Odd Ratio (OR) and 95% CI were used to calculate the strength of associations between independent and dependent variables (CI). For each variable, bivariate analysis was used to examine the relationship between independent variables and dietary diversity practice. The variables found to have ($p<0.25$) in the bi-variable logistic regression were entered into a multivariable logistic regression model to control for potential confounder effects. Finally, variables with $p<0.05$ were declared to have a significant relationship with adequate dietary intake.

RESULTS

Adult PLW HA socio-demographic characteristics

The current study included 384 study participants, with a 100% response rate. Among the adult PLW HA participants in this study, 133 (34.6%) were between the ages of 45 and 54. More than half of the total participants, 206 (53.6%), were male. Almost half of the study subjects, 195 (50.8%), did not attend formal school. The vast majority of respondents, 292 (76%), had never married. 218 (56.8%) of the people in the current study had a family size of five or more. In terms of occupation, 163 (42.4%) were housewives. On the other hand, the vast majority of participants in the study, 304 (79.2%), had a monthly income of 1,000 or less Ethiopian Birr (Table 1).

Adults receiving ART have certain health characteristics

312 (81.3%) of the adult PLW HA participants in the study received medication care and support. Similarly, the vast majority of study participants, 351 (91.4%), received dietary counseling. The majority of respondents, 285 (74.2%), did not have eating problems. 313 (81.5%) of the study subjects in the current study were in clinical stages I and II. More than half of the study participants (52.3%) did not receive cotrimoxazole prophylaxis.

The vast majority of study participants, 329 (85.7%) and 361 (94.0%), had no history of medication interruption or opportunistic infections. 292 (76.0%) of all participants were on a first-line regimen. 142 (37.0%) of all study participants had CD4 cell counts greater than 500. More than half of the current participants, 209 (54.4%), had been on ART for twelve months or less. The vast majority of the adults in the study, 346 (90.1%), had no history of regimen change. Almost three-quarters of the study participants, 286 (74.5%), had normal nutritional status. More than half of the adult PLWH participants in this study, 230 (59.9%), had poor quality of life (Table 2).

Adult behavioral characteristics getting ART

The vast majority of participants in the study, 315 (82.0%), 265 (69.0%), and 280 (72.9%), respectively, had no history of smoking, alcohol use, or chat chewing (Table 3).

Variety of foods consumed by respondents in the previous 24 hours

Sweets 276 (71.9%), milk and milk products 260 (67.7%), cereals 209 (54.4%), oil and fat 200 (52.1%), and legumes, nuts, and seeds 198 (51.6%) were the most commonly eaten foods within the previous 24 hours before data collection in the current study. White roots and tubers, vegetables, fruits, meat, fish and seafood, eggs and spices, condiments and beverages, on the other hand, were consumed by less than half of the study participants.

Adults' dietary intake adequacy getting ART

The overall dietary intake adequacy and inadequacy rates in this study were (38.8%) and (61.2%), respectively.

Analysis of variables: Variables associated with dietary intake adequacy in bivariate analysis were marital status, household number, clinical stages of HIV/AIDS, and nutritional status of adult PLW HA.

Multivariate analysis: Similar variables were associated with the outcome variable once again in multivariate analysis. Specifically, marital status, household size, clinical stage, and nutritional status. As a result, ever married people were 0.366 times less likely to have an inadequate dietary intake than their counterparts (AOR=0.366; 95% CI: (0.211, 0.634)). Families with five or more children were 2.495 times more likely to have inadequate dietary intake than families with fewer children (AOR=2.45; 95% CI: (1.522, 4.088)). When compared to stage I and II, HIV patients in clinical stages three and four were 2.474 times more likely to have adequate dietary intake (AOR= 2.474; 95% CI: (1.124,5.444)).

When compared to individuals with under nutrition, HIV patients with obesity were 0.290 times less likely to have inadequate intake (AOR=0.290; 95% CI: (0.099, 0.846)) (Table 4).

Table 1: Sociodemographic characteristics of adults receiving ART in Ilu Abbabor Zone, South West, Ethiopia, in 2020.

Variables	Category	Frequency	Percent
Age	15-24	118	30.7
	25-34	59	15.4
	35-44	74	19.3
	45-54	133	34.6
Sex	male	206	53.6
	female	178	46.4
Education Status	No formal education	195	50.8
	Read and write	54	14.1
	Elementary	41	10.7
	Secondary and above	94	24.5
Marital status	Never married	92	24
	Ever married	292	76
House	<5	166	43.2
Hold number	>/=5	218	56.8
Occupation	Farmer	73	19
	Housewife	163	42.4
	Merchant	116	30.2
	Government employee	10	2.6
Monthly	</=1000	304	79.2
Income	>1000	80	20.8

Table 2: Health-related characteristics of adults receiving ART in Ilu Abbabor Zone, South West, Ethiopia, in 2020.

Variables	Category	Frequency	Percent
Care and Support	no	72	18.8
	yes	312	81.3
Dietary Counseling	no	33	8.6
	yes	351	91.4
Problems with eating	no	99	25.8
	yes	285	74.2
Clinical stage	Stage I and II	313	81.5
	Stage-III and IV	71	18.5
Cotrimozazole	No	201	52.3
Prophylaxis	Yes	183	47.7
Treatment	No	329	85.7
Interruption	Yes	55	14.3
Opportunistic	No	361	94
Infections	Yes	23	6
Line of regimen	First line	292	76
	Second line	92	24

CD4 Count	<200	46	12
	201-350	68	17.7
	351-500	128	33.3
	>500	142	37
Duration on ART	</=12 months	209	54.4
	>12 months	175	45.6
Regimen	No	346	90.1
Change	Yes	38	9.9
Nutritional status	Under nutrition	60	15.6
	Normal	286	74.5
	Obese	38	9.9
Quality of life	Poor	230	59.9
	Good	154	40.1

Table 3: Behavioral characteristics of adults receiving ART in Ilu Abbabor Zone, South West, Ethiopia, in 2020.

Variables	Category	Frequency	Percent
Current smoking status	No	315	82
	Yes	69	18
Alcohol use	No	265	69
	Yes	119	31
Chat Chewing	No	280	72.9
	Yes	104	27.1

Table 4: Shows the factors associated with adequate dietary intake in adults. Receiving ART in Ilu Abbabor Zone, South West, Ethiopia, in 2020.

Variables	Categories	Dietary intake adequacy status		COR (95% CI)	AOR (95% CI)	P-Value
		Inadequate	Adequate			
Marital status	Never married	129	77	1	1	280
	Ever married	106	72	0.377(0.217,0.657)	0.366(0.211,0.634)	280
Household number	<5	124	42	1	1	280
	>/=5	111	107	2.406(1.454,3.981)	2.495(1.522,4.088)	280
Clinical stage of AIDS	I and II	180	133	1	1	280
	III and IV	55	16	2.218(1.951, 5.174)	2.474(1.124,5.444)	280
Nutritional status	Under nutrition	33	27	1	1	280
	Normal	171	115	0.930(0.495,1.746)	0.915(0.488,1.716)	280
	Obese	31	7	0.282(0.096,0.826)	0.290(0.099,0.846)	280

Note: COR-Crude Odd Ratio, AOR-Adjusted Odd Ratio, CI-Confidence Interval.

DISCUSSION

The current study aims to assess the value of nutritional consumption adequacy and associated factors among adult PLW HA in selected health centers in Ilu Abbabor Zone, South West, Ethiopia. In this study area, the location that represented the majority of adult PLW HA had insufficient nutritional consumption. According to this file, adult PLW HA nutritional consumption adequacy is significantly related to marital status, clinical stages of HIV/AIDS, household variety, and dietary popularity. The location indicated that the looked at contributors (61.2%) had an insufficient nutritional intake. It became similar to other studies of all respondents (62.3%) and (60.1%) had insufficient nutritional consumption in Kathmandu, Nepal (62.3%) and Kembata Tembaro Zone, Southern, Indonesia (60.1%).

Similar to other studies, all respondents (62.3%) and (60.1%) had insufficient nutritional consumption in Kathmandu, Nepal (62.3%) and Kembata Tembaro Zone, Southern, respectively [24,25].

However, it was lower than an examination conducted in Motta Town, East Ethiopia, which revealed that the various study subjects (70.5%) had consumed insufficient dietary variety [19]. The discrepancies are most likely due to socioeconomic and cultural differences between the two examining settings. On the other hand, it has improved over looking at Eastern Ethiopia. Eighty-

seven (28.7%) of those observed had a low nutritional range (four meals per day) [17].

Similarly, it is higher than a study conducted in Nigeria, which discovered that forty percent of adult participants in the study had poor nutritional range practices [26]. Differences in pattern length and socioeconomic reputation of the two settings could explain the inconsistencies.

In this study, marital status was found to be one of the variables most strongly associated with dietary intake adequacy. Even married people were less likely to be nutritionally deficient. The reason could be that married people had family responsibilities to save money and other belongings in order to have enough money for a variety of meals. Similarly, the number of residence preserves is another variable associated with dietary intake adequacy. As a result, families with five or more children were more likely to have inadequate dietary consumption than families with fewer than five children. It became consistent with a study carried out in Nigeria, which discovered that the number of children in a household became predictive of high dietary range [26]. A possible rationalization is that a long period of relative will increase demand for food, resulting in an inability to afford a specific type of food to meet an individual's needs. Similarly, patients with advanced AIDS were much more likely to have an adequate dietary intake in this study.

The plausible explanation is that patients with advanced disease may also suffer from that one-of-a-kind opportunistic infection, which may affect productivity involvement in order to afford that type of food. Finally, dietary fame became one of the variable factors associated with dietary consumption adequacy. As a result, humans with low vitamin levels are much more likely than their counterparts to have insufficient dietary intake. The possible reason is that nutrition hastens the progression of HIV to AIDS and influences a wide range of working days to engage in productivity for monetary gain to purchase various types of meals.

CONCLUSION

In the current study, full-size quantity of adult PLW HA, 61.2% inadequate nutritional consumption PLW HA in selected health facilities of Ilu Abbabor Zone, South West Ethiopia. Furthermore, marital status, residence keep variety, medical degree of the sickness, and dietary reputation were related to PLW HA's dietary consumption adequacy. As a result, health professionals working in the Ilu Abbabor area's health centers must provide care and assistance to single people during their visit and at every point of contact. To deal with the difficulty of one's own family size, a circle of relatives making plans is relatively recommended, as is the integration of vitamins with RH offerings. Finally, to reduce the rapid progression of HIV to Acquired Immune Deficiency Syndrome (AIDS), early detection and treatment are essential.

REFERENCES

1. Jayawardena R, Byrne NM, Soares MJ, Katulanda P, Yadav B, Hills AP. High dietary diversity is associated with obesity in Sri Lankan adults: an evaluation of three dietary scores. BMC public health. 2013; 13(1):1-8.
2. Woldemariam AT, Yusuf ME, Beyen TK, Yenit MK. Factors associated with dietary diversity among HIV positive adults (≥ 18 years) attending ART clinic at Mettema Hospital, Northwest Ethiopia: cross-sectional study. J AIDS Clin Res. 2015;6(8).
3. Nsele N. The effect of seasonal food variety and dietary diversity on the nutritional status of a rural community in KZN (Doctoral dissertation).
4. Onyango AC, Walingo MK, Mbagaya G, Kakai R. Assessing nutrient intake and nutrient status of HIV seropositive patients attending clinic at Chulaimbo Sub-District Hospital, Kenya.J Nutr Metab. 2012.
5. Sachdeva RK, Sharma A, Wanchu A, Dogra V, Singh S, Varma S. Dietary adequacy of HIV infected individuals in north India-A cross-sectional analysis. Indian J Med Res. 2011; 134(6):967.
6. Drimie S, Faber M, Vearey J, Nunez L. Dietary diversity of formal and informal residents in Johannesburg, South Africa. BMC public health. 2013; 13:1-9.
7. Mpontshane N, Van den Broeck J, Chhagan M, Luabeya KK, Johnson A, Bennish ML. HIV infection is associated with decreased dietary diversity in South African children. J Nutr. 2008; 138(9):1705-1711.
8. Drimie S, Tafesse G, Frayne B. Renewal Ethiopia background paper: HIV/AIDS, food and nutrition security. Washington, DC: International Food Policy Research Institute (IFPRI). 2006.
9. Drain PK, Kupka R, Mugusi F, Fawzi WW. Micronutrients in HIV-positive persons receiving highly active antiretroviral therapy. Am J Clin Nutr. 2007; 85(2):333-345.
10. Tolasa B, Dereje B, Temamen T, Belachew T. Food insecurity and associated factors among people living with HIV attending ART Clinic in Fitche Zonal Hospital, Ethiopia. Journal of Pharmacy and Alternative Medicine. 2015;8(3):8-17.
11. Belachew T, Hadley C, Lindstrom D, Gebremariam A, Lachat C, Kolsteren P. Food insecurity, school absenteeism and educational attainment of adolescents in Jimma Zone Southwest Ethiopia: a longitudinal study. Nutr J. 2011; 10:1-9.
12. Beatrice M, Francis M. Factors affecting dietary intake and dietary diversity score among adults living with HIV/AIDS in Uasin Gishu District Hospital, Kenya: a cross sectional study. IOSR J Nurs Health Sci. 2018;7(6):10-18.
13. Akwiwu UN, Akinbile LA. Dietary intake adequacy of people living with HIV/AIDS in rural communities of Imo State, Nigeria. J Agric Ext. 2017;21(1):218-230.
14. Zerihun KW, Muhammad EA, Biks GA, Belew AK, Hunegnaw MT. Predictors of dietary diversity among adults on antiretroviral therapy in Debre Tabor Hospital, northwest Ethiopia: A cross-sectional study.
15. Sirotin N, Hoover D, Segal-Isaacson CJ, Shi Q, Adedimeji A, Mutimura E, et al. Structural determinants of food insufficiency, low dietary diversity and BMI: a cross-sectional study of HIV-infected and HIV-negative Rwandan women. BMJ open. 2012; 2(2): e000714.
16. Palermo T, Rawat R, Weiser SD, Kadiyala S. Food access and diet quality are associated with quality-of-life outcomes among HIV-infected individuals in Uganda. PloS one. 2013; 8(4): e62353.
17. Weldegebreal F, Digaffe T, Mesfin F, Mitiku H. Dietary diversity and associated factors among HIV positive adults attending antiretroviral therapy clinics at Hiwot Fana and Dilchora Hospitals, eastern Ethiopia. HIV/AIDS-Research and Palliative Care. 2018: 63-72.
18. Taye K, Alemayehu D, Tadesse E, Tiki T. Level of dietary diversity and associated factors among adult patients on HAART at public health facilities of Ambo town, West Shoa Zone Ethiopia. J Trop Dis. 2019;7(5).
19. Tesfaw A, Jara D, Temesgen H. Dietary diversity and associated factors among HIV positive adult patients attending public health facilities in Motta Town, East Gojjam Zone, Northwest Ethiopia, 2017. Adv Public Health. 2018:1-8.
20. Bedassa DB, Gamebo TD, Teferi DY. Body weight loss and associated factors among adults People living with HIV/AIDS on antiretroviral therapy in Shashemane referral Hospital, Oromia national regional state, Ethiopia: A facility based cross sectional Study.

21. Ahmed KY, Page A, Arora A, Ogbo FA. Trends and factors associated with complementary feeding practices in Ethiopia from 2005 to 2016. Matern Child Nutr. 2020;16(2): e12926.

22. Suthar AB, Nagata JM, Nsanzimana S, Bärnighausen T, Negussie EK, Doherty MC. Performance-based financing for improving HIV/AIDS service delivery: a systematic review. BMC health services research. 2017; 17(1):1-10

23. Belachew T, Hassan K. Dietary Diversity Practice and its associated factors among Adult People Living with HIV who go to health facilities in Ilu Abbabor Zone, South West Ethiopia: a facility-based cross-sectional study.

24. Khatri S, Amatya A, Shrestha B. 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. 2020; 6(1):1-3.

25. Markos M, Lolaso T, Mengistu A, Tariku Z. Dietary diversity and associated factors among adult HIV positive patients on anti-retroviral therapy in public hospitals of Kembata Tembaro zone, Southern Ethiopia. HIV/AIDS-Research and Palliative Care. 2020: 859-868.

26. Ezenwosu I, Ossai E, Ezenwosu O, Agwu-Umahi O, Aguwa E. Nutrition knowledge and practice of dietary diversity among people living with HIV in a resource-limited setting: a multi-center study. HIV & AIDS Review. International Journal of HIV-Related Problems.;21(2):121-128.