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REVIEW

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Low dietary diversity and associated factors among adult people with HIV patients attending ART clinics of Ethiopia. Systematic review and meta-analysis

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Abstract

Introduction Dietary diversity is the utilization of food and food groups consumed by individuals over 24 h, which is an indicator of a diet's micronutrient adequacy. Dietary management in people with HIV patients is the key to sustaining their day-to-day activities and contributing to their lively hood. The level of dietary diversity among HIV-positive patients in Ethiopia shows considerable variation, ranging from 29 to 71.3%. This study aimed to assess the pooled prevalence of low dietary diversity and associated factors among HIV-positive patients attending ART clinics in Ethiopia.

Method Multiple international database searching methods (articles found in PubMed/MEDLINE, Google scholar Africa, Hinari journal online, Embase, Scopus) and Ethiopian university repository online have been covered in this systemic review and meta-analysis. Data were extracted using Microsoft excel and analyzed by using the Stata version 14 software program. The heterogeneity between studies and publication bias was detected by using the I^2 test and a funnel plot test respectively.

Results The pooled prevalence of low dietary diversity among People with HIV patients on antiretroviral therapy in Ethiopia was 55.9% 95% CI (45.73, 66.09) based on the random effect analysis. This systemic review and meta-analysis showed that only HIV positive patients with an antiretroviral therapy duration of less than one year (AOR = 2.3, 95% CI 1.3, 4.1), and having low wealth quintile (AOR = 2.5, 95% CI 1.5, 4.4) were factors significantly associated with low dietary diversity among People with HIV patients on ant-retroviral therapy clinics of Ethiopia.

Conclusion and recommendation The overall pooled prevalence of low dietary diversity among People with HIV patients attending antiretroviral therapy clinics in Ethiopia was high. We strongly recommend holistic nutritional interventions to address nutritional problems and promote the overall health status of HIV-positive patients in Ethiopia.

Keywords Dietary diversity, HIV, Antiretroviral therapy, Ethiopia

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Introduction

Dietary diversity is the utilization of food and food groups consumed by individuals over 24 h, which is an indicator of a diet's micronutrient adequacy [1]. It is also a proxy indicator of adequate intake of energy and micronutrients at the individual level [1]. Dietary diversity can be classified as an undiversified diet (≤ 5 food groups) or a diversified diet (≥ 6 food groups) [2].

Adequate dietary intake alongside ART helps the immune system to be strong and enables it to fight diseases better [3]. Even though nutrition is an important factor in all stages of HIV-positive patients, some clinical studies showed that they have reduced appetite and a higher incidence of diahrea resulting in malabsorption and nutrient losses [4]. Nutrition is a vital component of consolidated ART care for HIV-positive patients in resource-limited settings where malnutrition and food insecurity are endemic [5].

In developing countries, chronic patients with HIV/AIDS are at high risk of undiversified nutrition due to the consumption of monotonous food that leads to both micronutrient and macronutrient deficiencies [6]. Diversified foods across and within food groups are highly recommended in most dietary guidelines explaining that there is no single food that contains all the necessary nutrients for optimal health [7]. Dietary management in HIV-positive patients is the key to sustaining their day-to-day activities and contributing to their life hood [8].

The level of dietary diversity among HIV-positive patients in Ethiopia ranges from 29 to 71.3%; the lowest is from oromia [9] and the highest is from the Harar region [10]. Factors such as low economic status, level of education, media exposure in the household, nutritional counseling, marital status, occupation, and employment status were contributing factors to low dietary diversity among HIV-positive patients. Although Eating a diversified food for HIV positive patients enhances resistance to opportunistic infections and makes individuals more productive in their day to day activity; it is still a public health concern in low-income countries [11, 12].

Although Ethiopia has made an effort to address the impact of HIV/AIDS on nutrition by preparing national guidelines for HIV-positive patients, previous study findings showed the level of dietary diversity was low [13, 14]. Even though there is a complex interaction between dietary diversity, immune function, HIV/AIDS, and malnutrition; there are no pieces of evidence that suggest the pooled prevalence of dietary diversity among HIV-positive patients at the country level. Therefore, this systemic review and metanalysis aimed to assess the pooled prevalence of low dietary diversity and associated factors among People with HIV patients attending ART clinics in Ethiopia.

Methods

Study design and search strategy

We searched the PROSPERO database (http://www.library.ucsf.edu/) to determine if any published or ongoing systematic reviews were related to our topic in order to avoid duplication. Our search found no existing systematic reviews similar to our subject. The protocol for this systematic review has been registered in the PROSPERO database under ID number 338,374.

We conducted a search for articles on dietary diversity and its associated factors among People with HIV patients attending ART clinics in Ethiopia. The databases and platforms searched included PubMed/MEDLINE, Scopus, the Ethiopian University Repository, Hinari Journal Online, Google Scholar Africa, and Embase. The search utilized MESH terms such as "dietary diversity OR level of dietary diversity AND associated factors OR HIV-positive patients AND antiretroviral therapy AND Ethiopia." This systematic review and meta-analysis was carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Inclusion criteria

We included studies that assess dietary diversity among adult People with HIV patients attending ART clinics in Ethiopia, as well as those evaluating the factors associated with dietary diversity in this population. Only cross-sectional studies published in English were considered for inclusion.

Exclusion criteria

We excluded duplicate articles, as well as those for which the full text or abstract was inaccessible or lacked sufficient information. Additionally, interventional studies and commentaries were not included in this review.

Data extraction and quality assessment

Standard data extraction methods were employed to collect relevant information from the selected studies. The data extracted included author names, sample size, study region, study design, publication year, odds ratio (OR), and 95% confidence interval (CI), all of which were recorded using a predefined data extraction template. Data extraction and review of the relevant information were independently carried out by authors BT and YS using a standard Microsoft Excel spreadsheet. Any disagreements were resolved through discussion. Ultimately, studies that met the eligibility criteria were included in the final analysis.

Outcome variable

The outcome of interest for this systemic review and meta-analysis was low dietary diversity among People

with HIV patients attending ART clinics in Ethiopia. The outcome variable is calculated by the pooled prevalence of low dietary diversity among adult HIV patients attending ART clinics in Ethiopia. The second outcome of interest is factors associated with low dietary diversity among HIV-positive clients attending ART clinics in Ethiopia, and it is calculated by factors associated with dietary diversity in each study using the log add ratio.

Data processing and analysis

Data extraction was performed using Microsoft Excel, while data analysis was conducted using STATA version 14 software. The pooled prevalence of low dietary diversity was calculated using a random-effects meta-analysis. A funnel plot test at a 5% significance level was conducted to assess publication bias. Heterogeneity across studies was evaluated using the Cochran Q-statistic and the I^2 test. A subgroup analysis by region was performed to compare the prevalence of dietary diversity across different regions of Ethiopia. The association between low dietary diversity and its related factors was determined using adjusted odds ratios (AOR). The point prevalence was visualized using a forest plot with 95% confidence intervals (CI).

Result

Identification of included studies

We searched articles through database searching engines (PubMed/MEDLINE (75 articles), Google scholar Africa (15 articles), Hinari journal online(10 articles), Embase(5 articles), Scopus(15 articles), and Ethiopian university repository online(5 articles) and we found 125 articles. (Fig. 1)

Characteristics of included studies

In this systemic review and meta-analysis, a total of 8 cross-sectional studies that assessed low dietary diversity and associated factors among 2,856 People with HIV patients attending ART clinics in Ethiopia were included. Based on the regional distribution of searched studies; five studies were from the Amhara region; one article from Harar, Oromia, and the South region each were included in our review. (Table 1)

Overall, dietary diversity tends to be lower in HIV-infected individuals compared to non-HIV patients due to various factors, including the impact of the disease on nutritional needs, food insecurity, and social stigmas. Addressing these disparities through targeted interventions and support systems can help improve the

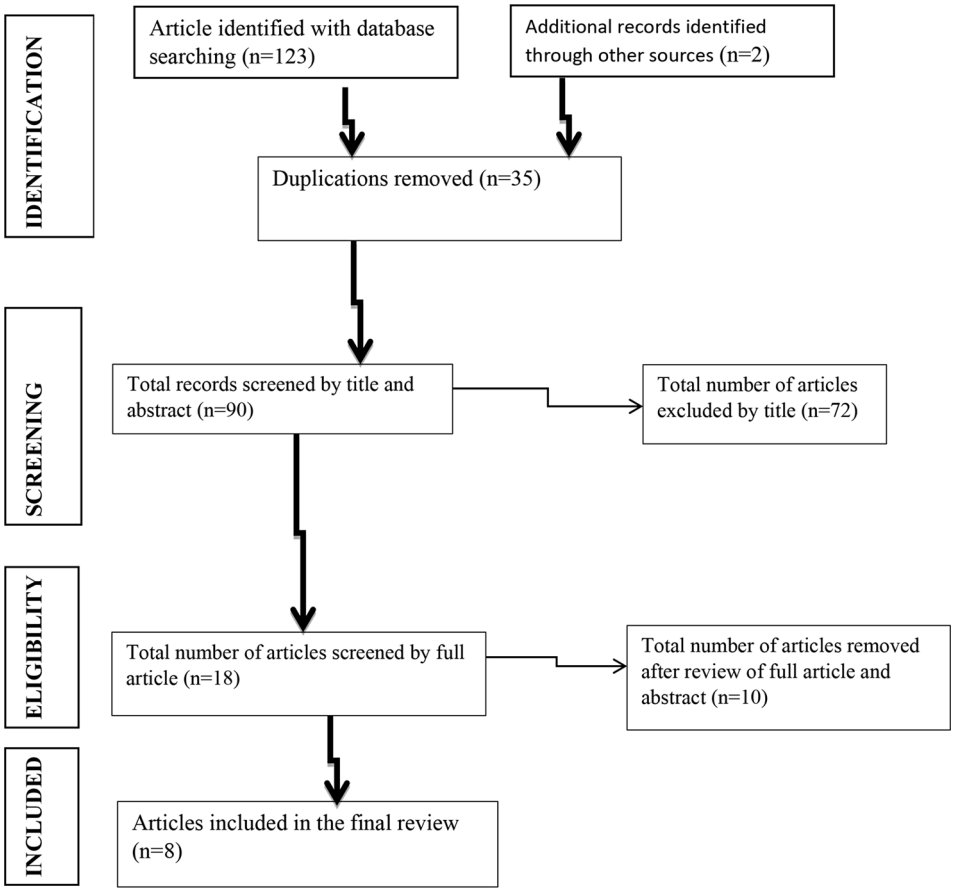

Fig. 1 Follow diagram of study selection for low dietary diversity and Associated Factors among HIV positive patients attending ART clinics in Ethiopia

Table 1 Description of the 8 studies included in systemic review and meta-analysis of low dietary diversity among people with HIV patients on anti-retroviral therapy in Ethiopia, 2022 [9, 15–20]

Name of authors	Year	Region	Sample size	Cases	Design	Response Rate
Kassam Wubnew Zerihun et al.	[13]	Amahara	341	227	cross-sectional	98.50%
Addisu Tesfaw et al.	[15]	Amahara	410	289	cross-sectional	100.00%
Hiwot Ahmed Said et al.	[16]	Amahara	352	143	cross-sectional	100.00%
Woldemariam AT et .Al	[20]	Amahara	378	221	cross-sectional	100%
Yihenew Sewale et al.	[18]	Amahara	412	218	cross-sectional	100.00%
Weldegebreal et al.	[10]	Harar	303	87	cross-sectional	100%
Taye K et al.	[9]	Oromia	313	220	cross-sectional	99%
Markos et al.	[17]	South	347	205	cross-sectional	98%

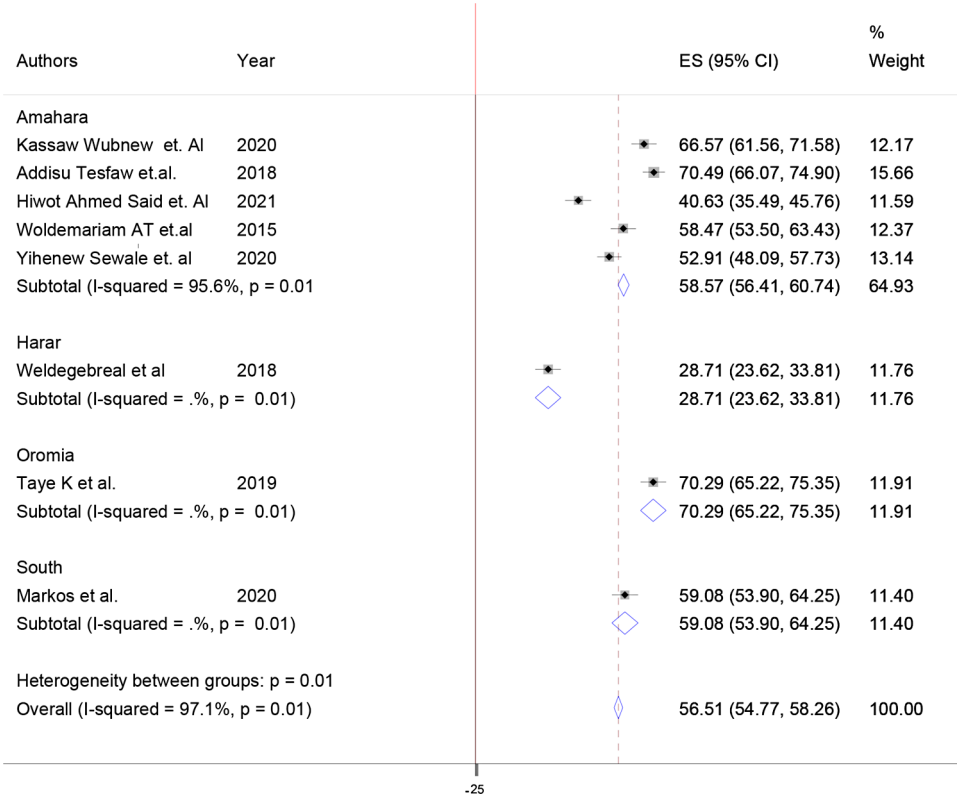

Fig. 2 Forest plot showing the subgroup analysis of low dietary diversity among People with HIV patients attending ART clinics in Ethiopia by region

nutritional status and health outcomes for those living with HIV.

Pooled prevalence of low dietary diversity among people with HIV patients attending ART clinics in Ethiopia

The level of low dietary diversity among People with HIV patients attending ART clinics was high in a study conducted Amhara region (70.49%), and the lowest was (28.71%) which is observed in the Harar region. The pooled prevalence of low dietary diversity among People with HIV patients in ART clinics in Ethiopia was 55.9%, 95% CI [45.73%, 66.09%] based on the random effect analysis.

Subgroup analysis of low dietary diversity among people with HIV patients attending ART clinics of Ethiopia

In the subgroup analysis of low dietary diversity among People with HIV patients attending ART clinics to compare the difference between regions of Ethiopia, we found the highest prevalence in Oromia 70.29%, (95% CI 65.22%,75.35). The next highest prevalence was observed in the south region 59.08% (95% CI 53.9%, 64.25%), the study observed in Harar is the lowest prevalence 28.71% (95% CI 23.62%, 33.81%) (Fig. 2).

Heterogeneity and publication bias

The I^2 (variation in ES attributable to heterogeneity) test result showed that there was considerable heterogeneity

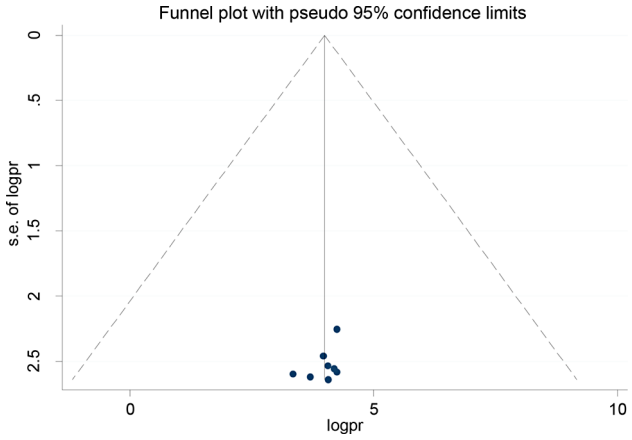

Fig. 3 Funnel plot for low dietary diversity among People with HIV patients attending ART clinics in Ethiopia

between groups (I-squared = 97.1%, $p \leq 0.001$). We assessed the presence of publication bias with articles included in this systemic review with a funnel plot test. The funnel plot graph showed that there was symmetric distribution among included studies through inspection which implies that there was no potential publication bias (Fig. 3**).**

Sensitivity analysis

We performed a sensitivity test by using a random-effect model, and the result showed that no single study influenced the overall pooled prevalence of dietary diversity among People with HIV patients in ant-retroviral therapy clinics in Ethiopia (Fig. 4).

Associated factors with low dietary dieversity among people with HIV patients in Ethiopia

In this systematic review and meta-analysis, only factors such as low income and ART duration of less than one year were factors significantly associated with low dietary diversity among People with HIV patients with ART. In this systematic review and meta-analysis, HIV-positive patients having the low wealth quintile were two points five times more likely to have low dietary diversity compared with adequate wealth quintile (AOR = 2.5, 95% CI, 1.5, 4.4). Low dietary diversity was also doubled among People with HIV patients whose ART duration was less than one year of duration (AOR = 2.3, 95% CI, 1.3, 4.1).

Discussion

In this systemic review and meta-analysis, the national pooled prevalence of low dietary diversity among People with HIV patients in ART clinics in Ethiopia was 55.9%, 95% CI [45.73%, 66.09%]. Even though there was no comparable systemic review similar to this topic, this finding is in line with studies conducted in Nigeria (62.3%) [21], and eastern Uganda (59%) [22]. However, this finding is higher than studies conducted in Uganda (14.7%) [23] Rwanda (43%) [24], Kenya (37.3%) [5], at the Mildmay center, Kampala, Uganda(12.4%). The difference might be due to study design difference, our study is on the national prevalence of low dietary diversity whereas the above-listed studies were single.

In our systemic review and meta-analysis variables such as low wealth quintile and ART duration of less than one year were significantly associated with low dietary

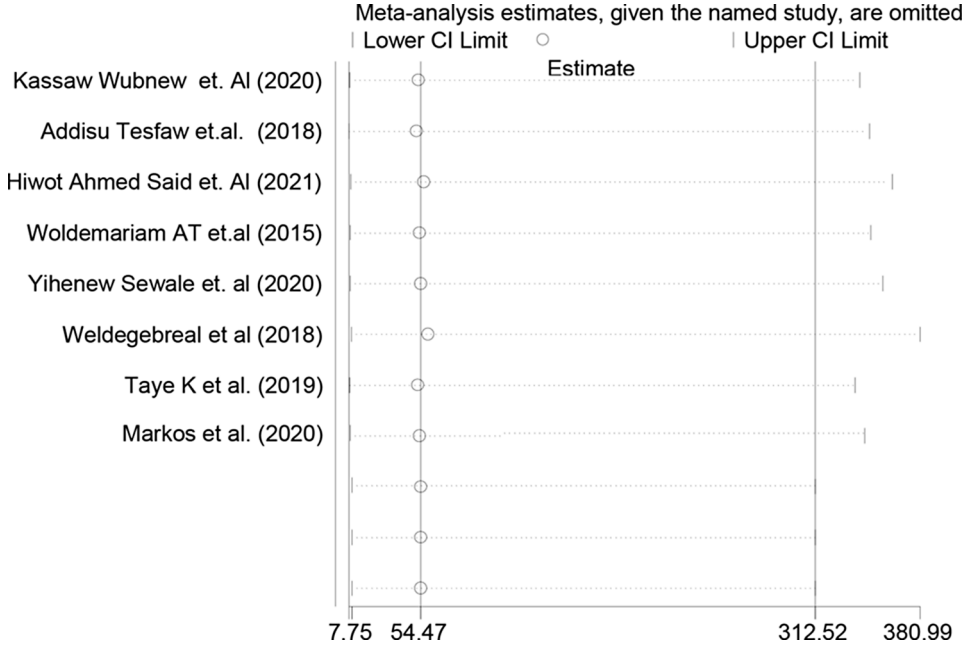

Fig. 4 Sensitivity test of low dietary diversity among People with HIV patients on ant-retroviral therapy in Ethiopia

diversity level of People with HIV patients receiving ART in Ethiopia. People with HIV patients receiving ART who had a low wealth quintile were two points five times more likely to have low dietary diversity compared with their counterparts. This finding is supported by studies done in Tanzania [25] and ghana [26] explained as households in the richest wealth quintile had the highest DD. This finding is also consistent with studies done in Kenya [27], Mali [28], and Rewanda [24]. The possible justification might be food consumption pattern of HIV-positive individuals with poor economic status may largely based on low cost, least nutritious, and monotonous food groups resulting in low dietary diversity. There is a significant association between income and the duration of ART. Higher income generally facilitates better access to healthcare, adherence to treatment, and overall health outcomes for individuals living with HIV. Conversely, lower income can create barriers that lead to shorter time on ART, poorer health outcomes, and increased risk of HIV-related complications.

The other variable significantly associated with low dietary diversity was ART duration of less than one year. People with HIV patients who had less than one year of ART duration were two times more likely to have low dietary diversity compared with their counterparts. This is explained as ART drugs may lead to reduced food consumption due to gastrointestinal tract-related side effects such as loss of appetite and dyspepsia that aggravates weight loss and nutritional problems experienced by HIV patients consequently ending up with low dietary diversity. In the early periods of ART, People with HIV individuals have reduced food consumption and little meal frequency which results in low dietary diversity due to adaptation problems.

Conclusion and recommendation

In this systematic review and meta-analysis, more than half of People with HIV patients attending antiretroviral therapy clinics in Ethiopia have low dietary diversity. Low dietary diversity was significantly higher among People with HIV patients on ART who have a low wealth quintile and ART duration of less than one year. Dietary diversity is linked to better ART adherence, healthcare providers should monitor whether patients' dietary habits are improving as part of the broader management plan for HIV care. Policymakers should fund and promote research into the dietary patterns, nutritional needs, and health outcomes of HIV-positive populations. Governments should initiate or scale up public health campaigns focusing on nutrition and HIV care.

Limitations of the study

All studies included in this systematic review and meta-analysis were facility-based; it is difficult to conclude for the entire community. Since we didn't find studies in all regions of the country, it might lack representativeness of the finding for all Regions of Ethiopia. Since the number of findings in our sub-group analysis was very small, the estimate of precision might be reduced in each region of Ethiopia. Bias might be present due to the language used for article searching is English language only.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12981-025-00702-2.

Supplementary Material 1

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Author contributions
YS and BTZ contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agreed to be accountable for all of the work.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

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Not applicable.

Consent for publication
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Competing interests
The authors declare no competing interests.

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References

1. Martin-Prével Y et al. *Moving forward on choosing a standard operational indicator of women's dietary diversity.* 2015.
2. Unicef, Organization WH. *The state of food security and nutrition in the world 2017: Building resilience for peace and food security.* 2017.
3. Nanziri C. Factors associated with dietary intake among HIV positive adults (18–65 years) at the Mildmay Center, Kampala, Uganda. Makerere University; 2010.
4. Ayele S, Zegeye EA, Nisbett N. Multi-sectoral nutrition policy and programme design, coordination and implementation in Ethiopia. Brighton: IDS; 2020.
5. 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):10–8.
6. Nsele N. *The effect of seasonal food variety and dietary diversity on the nutritional status of a rural community in KZN*. 2014.
7. Drimie S, et al. Dietary diversity of formal and informal residents in Johannesburg, South Africa. BMC Public Health. 2013;13(1):1–9.
8. Soyiri I, Laar A. *Dietary diversity approach: a key component to the management of HIV/AIDS patients in Ghana.* in *International Conference on AIDS, abstract.* 2004.

9. Taye K et al. 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).
10. Weldegebreal F, et al. Dietary diversity and associated factors among HIV positive adults attending antiretroviral therapy clinics at Hiwot Fana and Dilchora hospitals, eastern Ethiopia. HIV/AIDS (Auckland NZ). 2018;10:63.
11. Rajabiun S. *HIV/AIDS: A Guide for Nutrition.* Care, and Support: Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington, DC, 2001.
12. Woldemariam A et al. 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).
13. Zerihun KW, et al. Predictors of dietary diversity among adults on antiretroviral therapy in Debre Tabor Hospital, northwest Ethiopia: a cross-sectional study. 2020.
14. Health TF. D.R.o.E.M.o., *National Guidelines for HIV/AIDS and Nutrition.* 2008.
15. 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;2018(1):6135482.
16. Hiwot As. Dietary diversity and associated factors among hiv positive adults attending antiretroviral therapy clinic at felege hiwot comprehensive referral hospital, northwest, Ethiopia. 2020.
17. Markos M, et al. 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. pp. 859–68.
18. Sewale Y, et al. Magnitude of malnutrition and associated factors among HIV infected children attending HIV-care in three public hospitals in East and West Gojjam Zones, Amhara, Northwest, Ethiopia, 2017: a cross-sectional study. BMC Res Notes. 2018;11:1–6.
19. Weldegebreal F, et al. 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. pp. 63–72.
20. Amare T, Woldemariam ATW et al. *Factors associated with dietary diversity among HIV positive adults (≥ 18 years) attending ART clinic at Mettema hospital, Northwest Ethiopia: cross-sectional study.* 2015.
21. Akwiwu UN, Akinbile LA. Dietary intake adequacy of people living with HIV/AIDS in rural communities of Imo State, Nigeria. J Agricultural Ext. 2017;21(1):218–30.
22. Bukusuba J, Kikafunda JK, Whitehead RG. Food security status in households of people living with HIV/AIDS (PLWHA) in a Ugandan urban setting. Br J Nutr. 2007;98(1):211–7.
23. Palermo T, et al. Food access and diet quality are associated with quality of life outcomes among HIV-infected individuals in Uganda. PLoS ONE. 2013;8(4):e62353.
24. Sirotin N, 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.
25. Powell B, et al. The determinants of dietary diversity and nutrition: ethnonutrition knowledge of local people in the East Usambara Mountains, Tanzania. J Ethnobiol Ethnomed. 2017;13(1):1–12.
26. Codjoe SNA, Okutu D, Abu M. Urban household characteristics and dietary diversity: an analysis of food security in Accra, Ghana. FoodNutr Bull. 2016;37(2):202–18.
27. Onyango AC et al. *Assessing nutrient intake and nutrient status of HIV seropositive patients attending clinic at Chulaimbo Sub-District Hospital, Kenya.* Journal of nutrition and metabolism, 2012. 2012.
28. Torheim LE, et al. Nutrient adequacy and dietary diversity in rural Mali: association and determinants. Eur J Clin Nutr. 2004;58(4):594–604.

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