Published in final edited form as:

AIDS Care. 2018 December ; 30(12): 1567–1571. doi:10.1080/09540121.2018.1500011.

Food security and dietary diversity are associated with health related quality of life after 6 months of follow up among people living with HIV in Accra, Ghana

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Abstract

With the efficacy of antiretroviral therapy, people living with HIV (PLWH) are surviving longer and improving their health related quality of life (HRQoL) has become an important long-term HIV treatment and management indicator. HRQoL has been associated with various factors, including food insecurity (FI). The objective of this prospective study was to examine the association between FI and dietary diversity (HDDS) and HRQoL among PLWH in Accra, Ghana.

We recruited 152 PLWH from the HIV clinics of six district hospitals Accra, Ghana and utilized a prospective cohort study design with data collection at baseline, three and six months after recruitment for this study. Participants completed questionnaires measuring HRQoL, FI and HDDS. Repeated measures ANOVA was used to analyze the associations between FI and HRQoL as well as HDDS and HRQoL separately and then together.

Being food secure [0.035 (95% CI=0.005, 0.065)] and having a high dietary diversity score [0.029 (95% CI=0.004, 0.053)] were independently associated with an improvement in quality of life scores over time after adjusting for other covariates and each other.

Interventions to improve dietary diversity and food security among PLWH have the potential to improve nutritional status as well as HRQoL.

Introduction

Since the introduction of antiretroviral therapy (ART) has brought about longer survival times among people living with HIV (PLWH), maintaining and improving health-related quality of life (HRQoL) has become an important aspect of HIV management (Isa et al., 2016; Kaplan-Lewis, Aberg, & Lee, 2016). HRQoL describes people's perception of their well-being and how they can function physically (Lorenz et al., 2001) and is negatively associated with an increase in viral load and HIV disease progression, whether the PLWH is

on ART or not (Palermo et al., 2013). PLWH have been shown to have poorer HRQoL compared to the non-infected population (Maluccio et al., 2015).

Food insecurity (FI) which is the “limited or uncertain availability of nutritionally adequate foods or the inability to acquire them in socially acceptable ways” (Aibibula et al., 2018) is prevalent among PLWH especially those in resource limited settings (Weiser et al., 2014). FI among PLWH is associated with increased morbidity, lower CD4 counts, mortality (Aibibula et al., 2018; Rebick et al., 2016) as well as lower HRQoL (Hatsu, Hade, & Campa, 2017) independent of diet quality (Tesfaye et al., 2016). Dietary diversity, which is the number of food groups consumed over a recall period, is an easy to measure proxy indicator of nutrient and diet adequacy (Workicho et al., 2016) with low dietary diversity prevalent among PLWH in resource limited settings (Rebick et al., 2016).

Our objective was to prospectively evaluate the association between food insecurity, dietary diversity and quality of life among PLWH in Accra, Ghana.

Methods

Data collection

We used a prospective cohort study design with data collection at baseline, three and six months after recruitment. The study was carried out in the HIV clinics of six district hospitals in Accra, Ghana whose names are anonymized to protect the identities of the staff as explained previously (Sackey et al., 2017). For this pilot study, we recruited 152 participants (25 PLWH per clinic). To be eligible for this study, participants had to be HIV-positive, 18 years, must have been using ARTs 6 months and not pregnant. The Ghana Health Service Ethical Review Committee and the Rutgers Health Sciences IRB-Newark approved the study and written informed consent was obtained from all subjects.

Data collection spanned October 2015 to July 2016, and recruitment took two weeks per site (October–November 2015). Of the 152 participants recruited at baseline, 79% of participants returned at three and six months (within two weeks of their scheduled visit) (Figure 1). Of the 6% who withdrew from the study, pregnancy (per study protocol) was the most common reason given (Figure 1).

Study measures

Interviewer-administered questionnaires were administered during each visit. HRQoL was derived from the descriptive component of the EQ-5D-3L instrument made up of five dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) each with three severity levels (EuroQol). The responses can be converted to an EQ-5D utility scale from a value set (EuroQol; Maheswaran et al., 2016). The Zimbabwean EQ-5D value set was used in this study since there is no Ghanaian EQ-5D version. The EQ-5D utility scores obtained ranged from −0.29 (severe problems in all five dimensions) to 1.0 (no problems in all five dimensions) (Maheswaran et al., 2016).

Food insecurity was measured using the validated Household Food Insecurity Access Scale (HFIAS) (Coates, Swindale, & Bilinsky, 2007). The HFIAS is a nine-question scale with

scores ranging from 0–27 with a higher number indicating more severe food access insecurity. HFIAS scores were categorized into a binary variable (food secure/food insecure) (Coates, Swindale, & Bilinsky, 2007).

Dietary diversity was measured using the validated 12-item Household Dietary Diversity Score (HDDS) (Swindale & Bilinsky, 2006) with scores ranging from 0–12 with a higher score indicating greater dietary diversity. For the analysis, we created a binary variable (low; 0–8 and high dietary diversity; 9–12) based on the mean HDDS score (Table 2).

Statistical analysis

Repeated measures ANOVA was used to analyze the data using the maximum likelihood estimation method with an unstructured covariance structure. EQ-5D was the outcome of interest and 3 models are presented. Model 1 had food security (binary variable); model 2 had dietary diversity (binary variable) and model 3 had both food security and dietary diversity as the main predictors. All models controlled for individual factors (age, sex, time since HIV positive diagnosis, marital status, employment status, income, education) and household size as well as study visit and HIV clinic. PROC MIXED in SAS 9.3 (SAS Institute Inc.) was used for all data analyses and we found no evidence of multicollinearity nor violations of model assumptions. A p-value of <0.05 was considered statistically significant and all analyses were two-tailed.

Results

At baseline, participants had an average age of 40 years; had been HIV positive for 3.5 years; were mostly female (84%); and had some form of employment (82%) (Table 1).

EQ-5D scores increased significantly from 0.8 to 0.9 within the first 3 months of follow up but remained unchanged over the next 3 months (Table 2). The proportion of participants categorized as food secure increased from 21%–40% over the 6-month follow up (Table 2).

At baseline, cereals, vegetables, oil, salt/condiments were food categories consumed by at least 90% of participants whilst meat and eggs were the least consumed categories (Figure 2). Consumption patterns of individual food groups did not change over time except within the meat and fish groups (data not shown). Meat consumption decreased from 30% (baseline) to 23% (3-months) and increased to 43% (6-month visit) ($p=0.003$). Fish consumption increased from 83% (baseline) to 92% (3-months) and decreased to 81% (6-months) ($p=0.03$).

Both food security and dietary diversity status were independently associated with an increase in HRQoL scores over time after adjusting for other covariates (Table 3). Food secure PLWH had HRQoL scores 0.034 points ($p=0.03$; Model 1) higher over time compared with those food insecure (Table 3). Participants with high dietary diversity had HRQoL scores 0.028 points ($p=0.03$; Model 2) higher than those with low dietary diversity (Table 3). When both were included in the model, both food security 0.035 ($p=0.02$; Model 3) and high dietary diversity ($p=0.02$; Model 3) remained significantly associated with an increase in HRQoL scores over time after adjusting for other covariates and each other (Table 3). Follow

up time was also significantly associated with an increase in HRQoL scores over time (Table 3; Models 1–3).

Discussion

This study prospectively demonstrated significant relationships between food insecurity, dietary diversity and HRQoL independent of each other among PLWH. Being food secure was associated with higher quality of life scores over time and this was consistent with what was found in both resource-limited (Palermo et al., 2013) and resource-rich settings (Hatsu, Hade, & Campa, 2017).

Food insecurity and poor dietary diversity in resource-limited settings could impact HRQoL by promoting anxiety and stress (Chilton & Rose, 2009; Palermo et al., 2013) about securing food for oneself and family and thus could be risk factors for poor quality of life (Sharkey, Johnson, & Dean, 2011). In spite of the high dietary diversity scores observed in our study, the meat, dairy and eggs food groups (which are important sources of high quality protein and other nutrients) were the least consumed food groups in our sample. The changes in dietary diversity as well as doubling of food secure participants could be partially due to seasonality (rains lower prices of food) as well as participants over-exaggerating their initial responses in the hopes of getting aid from the researchers (monthly incomes were very low and unreliable since many participants engaged in petty trading). Reverse causality (where HRQoL influenced food insecurity) as well as some unmeasured confounders/effect modifiers could partially explain the associations observed.

Participants in our study had high HRQoL scores which could be a result of early diagnosis of HIV and the effectiveness of ARTs. In tandem with education programs to promote HIV testing, Ghana has adopted an opt-out strategy for testing all pregnant women for HIV (Nyuzaghl, Ohene, & Odoi-Agyarko, 2011). This means more female PLWH and their partners are being diagnosed, brought into the continuum of HIV care earlier, remaining healthy and having better HRQoL.

A limitation of our study was that both food insecurity, dietary diversity and HRQoL were self-reported. Another was that by including only PLWH who were taking ARTs, the findings may not be generalizable to ART-naïve PLWH. The prospective nature of this study however allowed us to observe relationships over time and was a strength of the study.

Conclusion

To our knowledge, this is the first study to prospectively assess the relationship between food insecurity and dietary diversity on HRQoL of PLWH. Food security and dietary diversity were independently associated with HRQoL over time after adjusting for multiple covariates. Interventions to improve dietary diversity and food security among PLWH have the potential to improve nutritional status as well as HRQoL and should be encouraged and included in programming activities for PLWH.

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Figure 1. Participant flow over 6 months of data collection

*Withdrawal means participant informed us they no longer wanted to be part of the study.

*Lost to follow up means participant missed their study visits and was unreachable by phone.

Figure 2. Consumption of dietary diversity food categories^a over 6 months (%)^a.

^aFood categories for dietary diversity derived from Household Dietary Diversity Score (HDDS)

* Consumption of foods in the meat ($p=0.003$) and fish ($p=0.03$) categories changed significantly.

Table 1.

Baseline demographics and medical history of participants (N=152).

	Mean (SD)
Age, y	40.0 (9.0)
Time since HIV diagnosis, y	3.5 (3.4)
Household size	4.0 (2.4)
	N (%)
Female	127 (84.1)
Employed	124 (82.2)
Married	70 (45.7)
Highest education level	
None	21 (13.9)
Primary/Secondary school	117 (77.5)
College	13 (8.6)
Monthly income <US\$78	77 (66.7)
Medical History	
Ever diagnosed with tuberculosis	21 (13.8)
Ever diagnosed with pneumonia	4 (2.6)

Table 2.

Dietary diversity, food insecurity and quality of life of participants over 6 months.

	Baseline	3-month	6-month	p
	Mean (SD)	Mean (SD)	Mean (SD)	
Dietary Diversity (HDDS) score	8.1 (1.6)	7.7 (1.6)	8.1 (1.9)	0.19
EQ-5D score	0.8 (0.1)	0.9 (0.1)	0.9 (0.1)	<0.001
	N (%)	N (%)	N (%)	
Low dietary diversity ^a	88 (58.30)	84 (70.0)	64 (56.1)	0.06
High dietary diversity	63 (41.70)	36 (30.0)	50 (43.9)	
Food insecure ^b	119 (78.9)	82 (68.3)	69 (60.5)	0.0049
Food secure	32 (21.2)	38 (31.7)	45 (39.5)	

Note: EQ-5D: EuroQol Five Dimensions Questionnaire, HDDS: Household Dietary Diversity Score

^aLow dietary diversity=HDDS score (0-8). High dietary diversity= HDDS score (9-12).^bFood insecurity is a combination of; mildly, moderately and severely food insecure categories of the HFIAS (Household Food Insecurity Access Scale).

Table 3.

Repeated measures regression models of the association between food insecurity, dietary diversity and quality of life.

Dependent variable: EQ-5D						
	Model 1 (only food insecurity) ^a		Model 2 (only diet diversity) ^a		Model 3 (both food insecurity and diet diversity) ^a	
Effect	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Food secure	0.034 (0.004, 0.064)	0.03			0.035 (0.005, 0.065)	0.02
High Diet Diversity			0.028 (0.003, 0.053)	0.03	0.029 (0.004, 0.053)	0.02
3-month visit	0.061 (0.035, 0.087)	<.0001	0.068 (0.043, 0.094)	<.0001	0.063 (0.037, 0.089)	<.0001
6 month visit	0.069 (0.037, 0.101)	<.0001	0.075 (0.044, 0.107)	<.0001	0.067 (0.034, 0.099)	<.0001
Age	0.001 (-0.001, 0.003)	0.46	0.001 (-0.001, 0.003)	0.39	0.001 (-0.001, 0.003)	0.43
Female	-0.013 (-0.061, 0.035)	0.59	-0.013 (-0.061, 0.034)	0.58	-0.015 (-0.062, 0.032)	0.54
Years since HIV diagnosis	-0.001 (-0.006, 0.003)	0.62	-0.002 (-0.006, 0.003)	0.51	-0.002 (-0.006, 0.003)	0.48
Married	0.013 (-0.024, 0.050)	0.49	0.014 (-0.023, 0.051)	0.46	0.015 (-0.022, 0.051)	0.42
AIC	-421.0		-420.9		-424.1	

Note: EQ-5D: EuroQol Five Dimensions Questionnaire.

^a All models also adjusted for: employment status, income, education, household size and HIV clinic which were statistically insignificant.