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Weight Gain Associated with Antiretroviral Therapy

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BACKGROUND

- Obesity is a public health crisis with a growing prevalence in persons with human immunodeficiency virus (PWH) population.
- Female sex, uninsured status, nonsmoking status, higher baseline BMI, higher baseline HIV-1 RNA, and baseline diagnosis of hypertension and diabetes are risk factors for developing obesity after initiation of antiretroviral therapy. [5,6]
- There has been growing evidence that integrase strand transfer inhibitor (INSTI) based regimens are a risk factor in the development of obesity compared to a non-nucleoside reverse transcriptase inhibitor (NNRTI) or protease inhibitor (PI) based regimen. [8]
- Among nucleoside/nucleotide reverse transcriptase inhibitor (NRTI) pairings, the combination of tenofovir alafenamide (TAF)/ emtricitabine (FTC) has been associated with more weight gain than abacavir (ABC)/ lamivudine (3TC) and tenofovir disoproxil fumarate (TDF)/FTC. [9,10]
- In this study, we aimed to investigate factors associated with weight gain in the PWH population.

METHODS

- This was a retrospective, IRB approved, single-center cohort study at The Ohio State University McCampbell Hall outpatient Infectious Diseases Clinic.
- Patients with ICD-9 or ICD-10 codes for HIV were identified from our electronic medical record system from January 1, 2015 to January 1, 2019.

2,591
- **Patients with ICD-9 or ICD-10 Codes for HIV**
- **January 1, 2015 – January 1, 2019**
- **Exclusion: Pregnancy, prisoners, Age <18 or >100**

811
- **Randomized sample evaluated**

300
- **Confirmed HIV diagnosis**
- **Two follow up visits within time period at the OSU IDC.**
- **Be on antiretroviral therapy for three months**
- **Evidence of viral suppression defined as two consecutive HIV RNA viral load <200**

- Cox Proportional Hazards models were used, taking a weight gain $\geq$ 3 kg as the event, and the time on therapy between visits as the time to event.
- Robust linear regression was used to model mean changes in weight, accounting for influential observations. In the robust regression models, follow up time was entered as a covariate to adjust for differential follow up time.
- All analysis were performed in STATA 16.0.

Primary Outcome	Secondary Outcome
• **Weight change over time**	• **Association with ethnicity, race, insurance status, co-morbid conditions, and concurrent medications**

RESULTS

Table 1: Characteristics of Study Population N=300

Age(years) (median, IQR)	48 (19-75)
Gender	Female: 38 (12.7%) Male: 262 (87.3%)
Ethnicity	Hispanic: 16 (5.3%) Non-Hispanic: 284 (94.6%)
Race	Asian: 6 (2%) Black: 100 (33.3%) White: 191 (63.6%) Not Reported: (1%)
Insurance Type	Private: 115 (38.3%) Medicaid: 30.3% (30.3%) Medicare: 68 (22.6%) Self Pay: 6 (2%)
Body Mass Index (mean, IQR)	27.81 (16-57)
Body Mass Index Breakdown	Underweight: 5 (2%) Normal: 97 (32.3%) Overweight: 110 (36.6%) Obese: 86 (28.6%)
Co-Morbid Problems	Essential Hypertension: 87 (29%) Hyperlipidemia: 94 (31.3%) Type 2 Diabetes Mellitus: 29 (9.6%) Tobacco Use: 47 (15.7%) Marijuana Use: 5 (1.6%) Coronary Artery Disease: 12 (4%) Insomnia: 11 (3.7%)
Concurrent Medications	Insulin: 12 (4%) Sulfonylurea: 5 (1.7%) Metformin: 16 (5.3%) Anticonvulsant: 33 (11%) SSRI/ SNRI: 59 (19.7%) TCA: 6 (2%) Antipsychotic Agent: 11 (3.6%) Beta-blocker: 27 (9%) Corticosteroid: 5 (1.7%) Hormone Therapy: 17 (5.6%)

Average weight change over follow up was 1.31kg (95% CI=0.58 -2.04kg, p=0.0004).

Figure 1: NRTI Breakdown

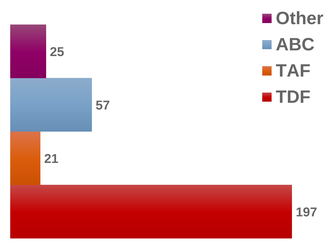


Figure 2: Baseline Antiretroviral Class

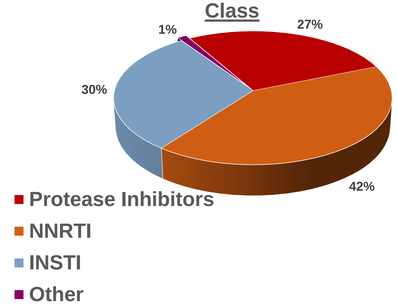
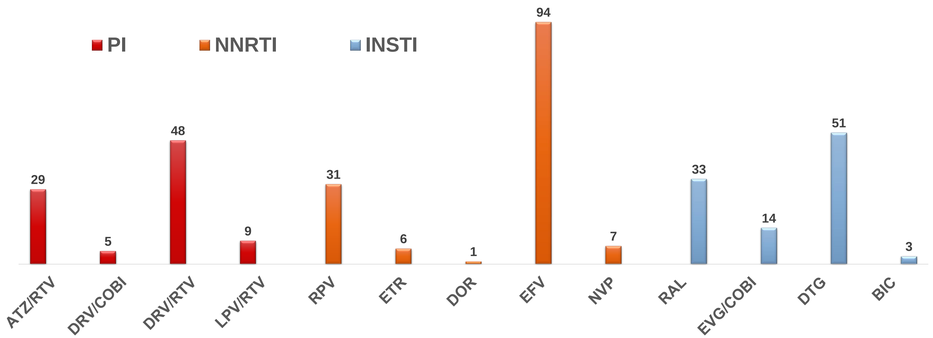


Figure 3: Antiretroviral Agents by Class



Risk factors for weight gain of > 3 kg – Cox Proportional Hazards Model

Table 2:	Univariate analysis			Multivariable analysis		
	HR	95% CI	p-value	HR	95% CI	p-value
TAF regimen	2.526	1.296 – 4.924	0.006	2.286	1.168 – 4.474	0.016
Hypertension	0.538	0.311 – 0.928	0.026			
INSTII regimen	1.581	0.988 – 2.531	0.056			

Table 3:	Univariate model		Multivariate model	
	Difference ± SE (kg)	p-value	Difference ± SE (kg)	p-value
Marijuana use	- 4.20 ± 1.63	0.01	- 4.74 ± 1.55	0.002
Darunavir use	- 1.36 ± 0.57	0.016	- 1.10 ± 0.55	0.046
Rilpivirine use	1.69 ± 0.69	0.014	1.97 ± 0.66	0.003
Bictegravir use	4.54 ± 2.11	0.032	4.57 ± 2.01	0.024
White race	- 0.77 ± 0.44	0.10	- 1.18 ± 0.43	0.007
Etravirine use	-3.62 ± 1.50	0.016	-3.08 ± 1.43	0.032

CONCLUSION

- As PWH are living longer on effective antiretroviral therapy, weight gain should be monitored as obesity contributes to morbidity and mortality from cardiovascular disease and metabolic diseases.
- Key factors for weight gain in our clinic population include baseline diagnosis of hypertension, use of TAF, use of INSTI and use of Rilpivirine.

FUTURE SCOPE

- We plan to compare weight change over time with the data collected in this study to the same population after they switched to an INSTI based regimen and/or TAF.

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