Left Ventricular Mass Adjustment for Body Size in Youth with Perinatal HIV or Perinatal HIV Exposure

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BACKGROUND

- Prior to widespread ART, cardiac-related complications were a common causes of death in youth living with perinatally-acquired HIV (YPHIV) or perinatally exposed but uninfected with HIV (YPHEU)
- Diagnosing **Left Ventricular Hypertrophy** (LVH) partially relies on **normalizations** of **Left Ventricular Mass** (LVM) by **body surface area** (BSA) or **height** (HT) raised to an **allometric exponent** (BSA: 1.35, HT: 2.70)
- In pediatric populations and particularly among YPHIV, additional adjustment for **lean and adipose body mass** (LBM, ABM) may provide more accurate LVH diagnoses.

METHODS

Study Population

- 269 AMP Youth (98 YPHEU, 171 YPHIV) enrolled in the Adolescent Master Protocol (AMP), a PHACS network study
- DEXA scan measurements for Lean Body Mass (LBM) and Adipose Body Mass (ABM) metrics

Statistical Methods

- LVM was normalized by BSA or HT, exponentiated to values estimated from both adults and AMP cohorts to create a LV Mass Index (LVMI)
  - Linear regression was used to estimate allometric exponents for each body size variable
  - Adjustment for LBM and/or ABM was considered
- Adjusted R^2 (aR^2) was used to assess the variation explained in LVM by each model
- Visual assessment of LVMI's robustness against proportion of ABM in whole body mass

RESULTS

- Median (IQR) Age (years) and BMI were 11.84 (9.57, 14.93) and 19.65 (16.93, 23.42)
- Mean (95% CI) Height Z-Score was -0.12 (-0.26, 0.03)
- 67% of youth were Black and 52% were Female
- Mean (95% CI) Left Ventricular Mass Z-Score was 0.21 (0.09, 0.32)

Adult **LVM** indices may be over-sensitive in diagnosing LVH in **perinatally exposed or infected youth**. Additional adjustment for **lean and adipose body mass** may provide more accurate LVH diagnoses in our cohort.

Figure 1: LVMIs by ABM% in YPHEU

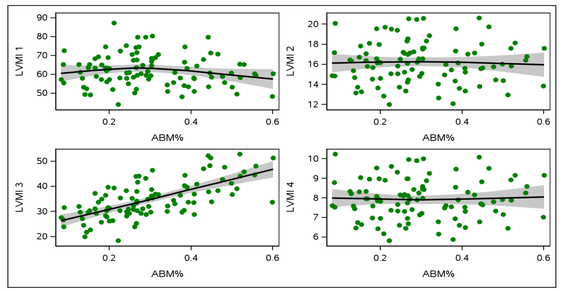
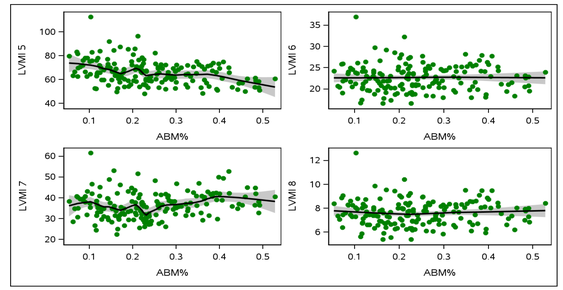


Figure 2: LVMIs by ABM% in YPHIV



Body Size Variables in LVM Standardizations: LVMI 1 and 5: BSA; LVMI 2 and 6: BSA, LBM, ABM; LVMI 3 and 7: HT; LVMI 4 and 8: HT, LBM, ABM

Table 1: LVMIs for BSA and Height Adjustments

	Left Ventricular Mass Index (LVMI)		
Adult Population	$\frac{LVM}{(BSA^{1.35})}$		
	$\frac{LVM}{(Height^{2.70})}$		
	LVMI	**Allometric Exponent***	**aR^2**
YPHEU (N = 98)	$\frac{LVM}{(BSA^{1.21})}$	1.21 (1.10, 1.32)	0.83
	$\frac{LVM}{(Height^{2.54})}$	2.54 (2.07, 3.00)	0.54
YPHIV (N = 171)	$\frac{LVM}{(BSA^{1.12})}$	1.12 (1.03, 1.21)	0.77
	$\frac{LVM}{(Height^{2.35})}$	2.35 (2.11, 2.59)	0.69

Table 2: LVM Adjustment for LBM and ABM

YPHEU (N = 98)		YPHIV (N = 171)	
Body Size Variables	**aR^2**	**Left Ventricular Mass Index (LVMI)**	**aR^2**
BSA, LBM	0.84	BSA, LBM	0.80
BSA, ABM	0.83	BSA, ABM	0.80
BSA, LBM, ABM	0.84	BSA, LBM, ABM	0.80
HT, LBM	0.72	HT, LBM	0.78
HT, ABM	0.79	HT, ABM	0.71
HT, LBM, ABM	0.83	HT, LBM, ABM	0.80

Allometric Exponent*: Mean (95% Confidence Interval)
Units: LVM (g), BSA(m^2), HT (m), ABM (Kg), LBM (Kg)
aR^2: Adjusted R^2

RESULTS

Summary of LVM adjusted for Body Size Metrics

- YPHIV allometric exponents were lower than YPHEU for indices adjusting for BSA or HT alone (Table 1)
  - Both exponents were lower in both cohorts than standards for adult populations
- The model adjusted R-squared (aR^2) increased by 0.11-0.29 in indices adjusting for HT after adding LBM and ABM for YPHIV and YPHEU (Table 2)
- The aR^2 increased by only 0.01-0.03 in indices adjusting for BSA after adding LBM and ABM for YPHIV and YPHEU (Table 2)
- YPHEU HT based indices without ABM demonstrated a positive linear relationship with ABM%, which disappeared after ABM adjustment (Figure 1, LVMI 3 & LVMI 4)

CONCLUSIONS

- LVMIs using estimates from YPHEU and YPHIV populations were higher than indices developed from adults
- Adult standards may be oversensitive for LVH diagnoses for YPHEU and YPHIV populations
- Adjusting LVM for lean and adipose body mass, in addition to HT or BSA, may provide more accurate LVH diagnoses for pediatric YPHIV and YPHEU
- Allometric normalizations including LBM and ABM may not be robust to the proportion of adipose in whole body mass.

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