PREVALENCE OF ANEMIA AND RISK FACTORS IN PEOPLE WITH HIV IN THE MODERN ART ERA

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Introduction

- In the modern ART era, anemia is less common in people with HIV (PWH) however, its prevalence and risk factors remain largely unknown.
- As anemia is an independent predictor of increased morbidity and mortality in PWH, we aimed to estimate its prevalence and examine the clinical and laboratory associations with anemia in both males and females.

Methods

- Using the NA-ACCORD, we estimated the annual prevalence between January 1, 2007- December 31, 2017 of anemia in PWH categorized as;
  - Mild (11.0-12.9g/dL males, 11.0-11.9g/dL females)
  - Moderate (8.0–10.9g/dL)
  - Severe (<8.0g/dL)
- Poisson regression models with robust variance estimated crude and adjusted prevalence ratios (aPR) and 95% confidence intervals comparing risk factors for those ever having a measure of no/mild anemia vs. moderate/severe anemia (outcome) during the study period.
- It was anticipated that risk factors would vary by sex, therefore results were stratified by sex.
- Time-fixed: age, sex, race/ethnicity, HIV acquisition risk, BMI, diabetes, hypertension, high cholesterol, chronic kidney disease, statin use, AIDS diagnoses, Hepatitis C (HCV) and B (HBV) infection at or prior to study entry.
- Time-varying: low (≤200cells/mm^3) CD4 count and unsuppressed HIV RNA (>200 copies/mL) per calendar year; if there were multiple measurements per year, the median was used.
- Antiretroviral (ART) use (including AZT), ribavirin or interferon use was defined as use anytime during the month of hemoglobin measure.

Despite decreasing over time, the prevalence of anemia among PWH is higher than that reported in the general population of high-income countries (~5%). There was a higher burden of anemia in PWH seen among those with low CD4 counts, emphasizing the importance of effective ART.

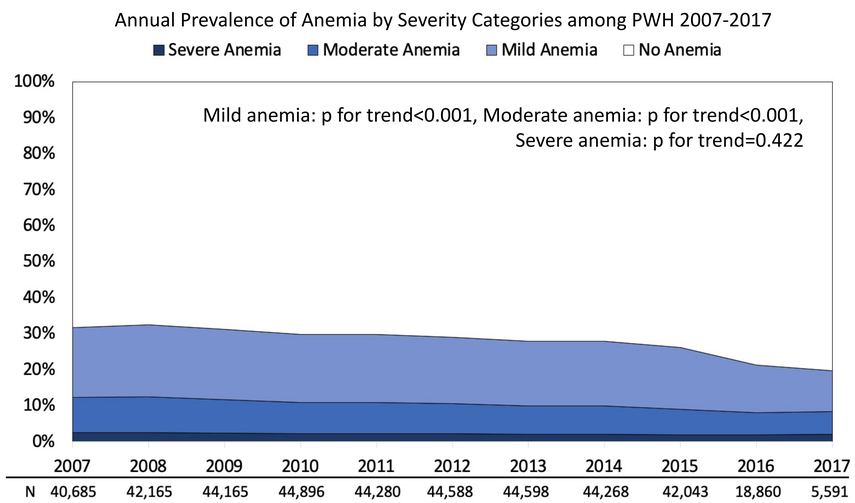
Results

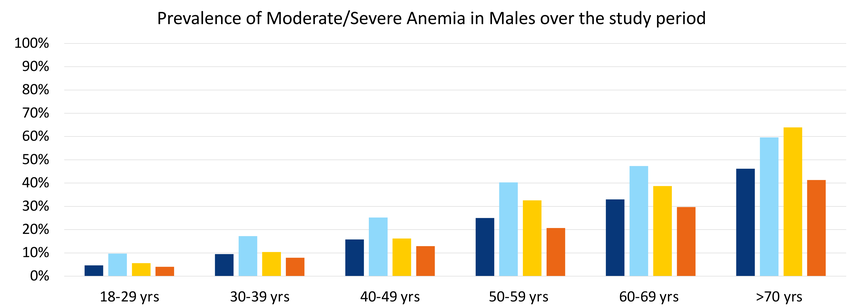
- Among 84,119 PWH, over the study period, 41,964 (49.9%) had at least one measure of anemia with 20,379 (24.2%) having mild anemia, 14,936 (17.8%) moderate anemia and 6,649 (7.9%) severe anemia.
- The average annual prevalence of anemia was 29.1% over the study period, this decreased from 2007 to 2017 (see shaded area plot).
- The risk of moderate/severe anemia was higher in females, Non-Hispanic Black and Hispanic PWH compared to Non-Hispanic White PWH, those underweight, with comorbidities and low CD4 counts (see bar charts and table).
- Aging increased anemia risk among males, but not females (see table).

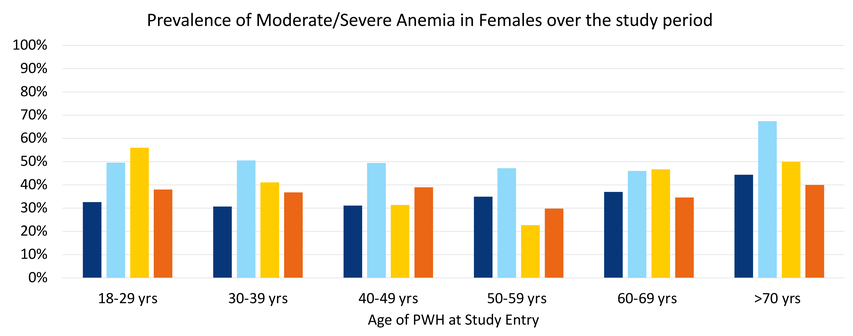
Crude (cPR) and adjusted (aPR) prevalence ratios of risk factors associated with moderate or severe anemia compared to mild or no anemia

Characteristic	cPR, 95% CI (N=84,119)		aPR, 95% CI (N=84,119)		aPR Males, 95% CI (N=74,119)		aPR Females, 95% CI (N=10,000)	
Age (per 10 year increase)	1.33	1.32-1.34	1.15	1.14-1.17	1.24	1.22-1.25	0.91	0.89-0.93
Sex								
Female	1.88	1.83-1.93	1.91	1.85-1.97	-	-	-	-
Race and ethnicity								
Non-Hispanic White	Ref		Ref		Ref		Ref	
Non-Hispanic Black	1.66	1.62-1.71	1.26	1.23-1.29	1.21	1.18-1.25	1.48	1.39-1.58
Hispanic	1.04	0.99-1.09	1.09	1.04-1.13	1.07	1.02-1.12	1.16	1.07-1.33
Other/unknown	0.83	0.78-0.88	0.95	0.90-1.01	0.93	0.87-0.99	1.15	1.03-1.29
BMI								
Underweight	2.15	2.09-2.21	1.46	1.41-1.51	1.48	1.43-1.54	1.27	1.17-1.37
Normal Range	Ref		Ref		Ref		Ref	
Overweight/Obese	0.72	0.67-0.71	0.73	0.72-0.75	0.69	0.67-0.71	0.88	0.84-0.93
Hepatitis B infection	1.27	1.21-1.33	1.11	1.07-1.16	1.13	1.08-1.18	1.06	0.95-1.18
Hepatitis C infection	1.90	1.85-1.94	1.20	1.17-1.24	1.24	1.21-1.28	1.12	1.04-1.19
Detectable Viral Load	1.28	1.24-1.31	1.04	1.02-1.07	1.08	1.05-1.11	0.99	0.94-1.04
Low CD4 count	2.52	2.46-2.58	1.91	1.86-1.95	1.98	1.93-2.04	1.60	1.52-1.68
No ART	0.94	0.83-1.06	0.99	0.88-1.12	1.11	0.94-1.32	0.77	0.55-1.07

Adjusted models include age, sex, year enrolled into cohort, race/ethnicity, HIV acquisition risk, BMI, diabetes, hypertension, high cholesterol, chronic kidney disease, smoking status, statin use, AIDS diagnoses, Hepatitis C (HCV) and B infection, Low (≤200cells/mm^3) CD4 count, unsuppressed HIV RNA (>200 copies/mL), ART use, AZT, ribavirin or interferon use.
Missing BMI, viral load, CD4 and ART use and smoking status variables were imputed using multiple imputation.







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