OP- 0204. HbA_{1c} for the diagnosis of diabetes in black South Africans: impact of anaemia, HIV infection, and anti-retroviral treatment (ART)

Tom R Hird¹, Fraser J Pirie², Tonya M Esterhuizen³, Brian O'Leary⁴, Elizabeth H Young⁵, Mark I McCarthy⁶, Manjinder S Sandhu⁷, Ayesha A Motala²

¹ Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK. ² Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, Durban, South Africa. ³ Centre for Evidence-Based Health Care, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch, South Africa. ⁴ Research and Policy Department, Office of Strategy Management, eThekweni Municipality, Durban, South Africa. ⁵ Wellcome Trust Sanger Institute Hinxton, U.K. ⁶ Oxford Centre for Diabetes, Endocrinology and Metabolism, University of Oxford, UK. ⁷ Department of Medicine, University of Cambridge, Cambridge, UK

Introduction

- Anaemia and infections may cause HbA_{1c} to falsely over- or underestimate glycaemia and limit its utility for diagnosis and detection of diabetes mellitus (DM), but have not been investigated in sub-Saharan African (SSA) populations
- South Africa has one of the highest burdens of HIV infection (HIV) and anaemia globally
- urban black Africans in Durban, South Africa (n=1178)
 - ↑ prevalence DM (%): OGTT 12.1 FPG 11.9 HbA_{1c} 13.1
 - vs. OGTT: HbA_{1c} 6.5% (48 mmol/mol) Sn 70.3% Sp 98.7%

Aim

To assess the association of anaemia, HIV and anti-retroviral treatment (ART) with HbA_{1c} and implications for detection and diagnosis of DM in an urban black South African population

Methods:

Durban Diabetes Study (DDS): South Africa

Survey

- cross-sectional
- multi-stage cluster
- adults ≥ 18yr
 - OGTT: plasma glucose
 - HbA_{1c}: HPLC (Bio-Rad)
 - HIV: immunoassay
 - Full blood count

Definitions

- WHO: 1999 for OGTT; 2011 for HbA_{1c}
- Anaemia: Hb (g/dl) < 12.0 F; <13.0 M
 - normocytic microcytic macrocytic
- HIV: -ve +ve
 - HIV+ ART- HIV+ ART+
- Analysis: STATA 14**
 - known DM excluded
 - age-standardised prevalence (WHO)
 - linear regression models: β (95% CI): absolute mean difference (AMD) in HbA_{1c}

Results

1. Total group

➤ n= 1067: men 318 women 749 mean age 39.7yr (38.8-40.7)

➤ Prevalence (% [95% CI])

Anaemia	28.8 (16.0-31.7)	HIV +ve 45.6 (42.4-48.8)
normocytic	17.2 (14.8-19.6)	ART- 29.6 (26.7-32.4)
microcytic	9.3 (3.5-11.1)	ART+ 16.1 (13.7-18.4)
macrocytic	2.3 (1.4-3.2)	

2. By Anaemia and HIV status

	No anaemia (n:758)	Anaemia			
		All (n:307)	Normocytic (n:183)	Microcytic (n:99)	Macrocytic (n:25)
Women (%)	62.6	89.8	84.8	99.0	64.0
Hb (g/dl)	13.7	10.9	11.4	10.2	11.1
HbA _{1c} (%)	5.5	5.5	5.5	5.7	5.0
HIV+ (%)	39.7	61.2	59.6	53.5	88.0
ART-	26.5	37.8	35.0	43.4	28.0
ART+	13.2	23.5	24.6	10.1	60.0

	HIV -ve (n:580)	HIV +ve		
		All (n:487)	ART- (n:315)	ART+ (n:172)
Women (%)	64.1	77.40	76.8	78.4
Hb (g/dl)	13.4	12.4	12.5	12.4
HbA _{1c} (%)	5.6	5.4	5.4	5.4
Anaemia (%)	19.7	37.0	35.2	40.4
normocytic	11.9	26.5	22.2	34.5
microcytic	7.8	10.7	13.3	5.8
macrocytic	5.2	4.5	2.2	8.7

3. Association of anaemia, HIV and ART with HbA_{1c}

*p<0.05, ** P<0.01, ***P<0.001 vs. no anaemia (a) or HIV-ve (b).

Model 1: adjusted for age, sex, FPG, 2PG, BMI, family history of D, smoking, ROH, SES, PUC.

Model 2: Model 1 + HIV and ART (for a), and + Hb. MCV, MCH (for b)

4. Prevalence of Diabetes

	% (95% CI)		P
	by OGTT	by HbA _{1c}	
Total (n:1067)	3.4 (2.5-4.8)	3.8 (2.7-5.3)	0.5
Anaemia			
No anaemia (n:760)	3.7 (2.5-5.4)	4.0 (2.7-5.8)	0.7
Anaemia (n:307)	2.9 (1.5-5.6)	3.3 (1.1-6.5)	0.7
normocytic (n:183)	2.7 (1.1-6.5)	2.7 (2.1-11.7)	1.0
microcytic (n:99)	4.0 (1.5-10.4)	5.1 (2.1-11.7)	0.6
hypochromic (n:25)	0.0 (-)	0.0 (-)	1.0
HIV status			
HIV-ve (n:580)	4.7 (2.8-6.5)	5.7 (3.6-7.8)	0.3
HIV+ve (n:487)	2.1 (0.8-3.3)	1.4 (0.4-2.5)	0.2
ART- (n:315)	1.6 (0.2-3.0)	1.6 (0.2-3.0)	1.0
ART+ (n:172)	2.8 (1.1-6.7)	1.3 (0.4-4.7)	0.1

Conclusion

- urban black South African population: HbA_{1c} for DM diagnosis anaemia, HIV, ART and HbA_{1c}
 - modest association
 - unlikely to affect utility of HbA_{1c} for detection of DM
- SSA
 - need for further studies

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