Diabetes and pre-diabetes among police officers in Guinea-Bissau

J Lindman, K Ström, A Biague, Z J Da Silva, K Jakobsson, H Norrgren, F Månsson, and the SWEGUB CORE group

Abstract

This study has investigated the prevalence of type 2 diabetes among 1119 police officers in Guinea-Bissau. Those with a random blood glucose (RBG) >8.0 mol/l had HbA1c (glycated haemoglobin) testing. Diabetes (HbA1c >6.5%) was present in 4.1%, and pre-diabetes (HbA1c 5.7–6.5%) was present in a further 4.2%. Factors associated with diabetes were age, weight and ethnicity.

Introduction

In 2013, there were 19.8 million people estimated to be living with diabetes in Africa – a prevalence of 4.8%, though with a high inter-country variation. The absolute number of cases was projected to increase up to 41.5 million in 2035.[1] Diabetes is thus becoming a serious public-health concern. Its prevalence in Guinea-Bissau has previously been estimated at 3–4%.[2,3] However a recent study from Guinea-Bissau among tuberculosis (TB) patients and controls found a lower prevalence than expected, i.e. 2.8 and 2.1%, respectively.[4] The aim of the present study was to estimate the prevalence of diabetes and pre-diabetes among police officers in Guinea-Bissau and to investigate associated factors.

Patients and methods

All individuals with regular employment in the Guinea-Bissau police force between 1990 and 2010 were invited to participate in an open cohort study with a focus on HIV infection, with regular follow up until 2011.[5,6] Between 2009 and 2010 all participants attending scheduled follow-up visits were screened for diabetes. Random blood glucose (RBG) levels were measured using HemoCue 201+ (HemoCue AB, Ängelholm, Sweden). Participants with RBG ≥8.0 mmol/l underwent HbA1c (glycated haemoglobin) testing. The cut-off of 8.0 mmol/l was chosen since the screening was performed on non-fasting individuals. For determination of HbA1c, whole blood was stored on filter paper (HbA1c Viapost) and later analysed using turbidimetric methodology with a Cobas 6000 machine (Roche Diagnostics Limited, Rotkreutz, Switzerland). Diabetes was defined as an HbA1c ≥6.5% (48 mmol/mol), while an HbA1c between 5.7 and 6.4% (38–47 mmol/mol) was considered to identify individuals with an increased risk of diabetes (pre-diabetes).[7] Owing to the probability of extensive loss of follow up and limited economic and administrative resources, measuring fasting blood glucose level (FBG) or the oral glucose tolerance test (OGTT) was deemed not feasible. The STATA IC 13.1 statistical package (StataCorp, College Station, TX, USA) was used for logistic regression. The study was approved by the Regional Ethical Board in Lund, Sweden and by the Ministry of Health, Guinea-Bissau.

J Lindman and H Norrgren, Department of Clinical Sciences Lund, Division of Infection Medicine, Lund University, Lund, Sweden; K Ström, Department of Internal Medicine, Värnamo Hospital, Värnamo, Sweden; A Biague, National Public Health Laboratory, Bissau, Guinea-Bissau; Z J Da Silva, Department of Occupational and Environmental Medicine, Lund University, Sweden; K Jakobsson, Department of Occupational and Environmental Medicine, Lund University and Department of Occupational and Environmental Medicine, Gothenburg University, Sweden; F Månsson, Department of Clinical Sciences, Infectious Diseases Research Unit, Lund University, Malmö, Sweden. Correspondence to: Jacob Lindman, Department of Clinical Sciences Lund, Division of Infection Medicine, Lund University, Lund, Sweden. Email: jacob.lopatko_lindman@med.lu.se

Results

In total, 1119 police officers (16% women; age range 19–83 years) were screened for RBG level; of these, 108 participants had RBG ≥8.0 mmol/l and were considered diabetes suspects. Out of these diabetes suspects, the HbA1c results of 15 individuals confirmed that they did not have diabetes and they were therefore excluded from the analysis. In 13 subjects, HbA1c analysis was performed but the blood glucose result was missing (but was assumed to have been ≥8.0 mmol/l). Of the 106 diabetes suspects with a recorded HbA1c result, 45 individuals had an HbA1c ≥6.5% and were considered as having diabetes, and 46 individuals had an HbA1c between 5.7 and 6.4%, and were considered as having pre-diabetes. The prevalence of diabetes was 4.1% and that of pre-diabetes 4.2%. Potential factors that could influence diabetes among police officers are presented in Table 1. Factors found to be significantly associated with diabetes but not with pre-diabetes (data not shown) in multivariate analysis were age, weight, and ethnicity.

Discussion

Using HbA1c values ≥6.5% as a definition, we found a diabetes prevalence of 4.1% and a pre-diabetes prevalence of 4.2%. These results are in line with previous estimations.[2,3,4] The prevalence was similar in men and women. As expected, the risk increased with age and weight.

Using the HbA1c assay as a diabetes diagnostic tool could have led us to underestimate prevalence, as numerous studies have shown that HbA1c identifies fewer subjects compared with FBG and the OGTT.[8] This may be related to several factors affecting HbA1c levels such as anaemia, haemoglobinopathies, medications, renal impairment, and ethnicity.[9] Except for ethnicity, these factors were not measured in our study. Of those with RBG >8.0 mmol/l, 12% did not have an HbA1c measurement available and were excluded – this may have led to underestimation of diabetes prevalence.

This study included police officers in a predominantly urban setting which limits the generalisability of our results. The finding of a higher prevalence of diabetes in some ethnic groups was not expected. Further studies including individuals from different socio-economic groups and different settings are needed to get a better understanding of diabetes epidemiology in Guinea-Bissau.

Table 1. Diabetes prevalence (%), and crude (POR) and adjusted prevalence odds ratios (aPORs) with respect to sociodemographic factors and HIV status in 1104 police officers from Guinea-Bissau

	n (%)	POR (95% CI)	aPOR[a] (95 % CI)
Gender			
Male	8/180 (4.4)	1	1
Female	37/924 (4.0)	0.90 (0.41–1.96)	0.91 (0.37–2.21)
Age			
≤44	15/603 (2.49)	1	1
≥45	30/490 (6.12)	2.56 (1.36–4.81)***	2.66 (1.33–5.32)**
Education			
<5	10/326 (3.07)	1	1
≥5	33/746 (4.42)	1.46 (0.71–3.00)	1.81 (0.82–4.02)
Ethnic origin			
Other	13/632 (2.06)	1	1
Mancaha	6/117 (5.13)	2.57 (0.95–6.91)	2.19 (0.80–5.98)
Mandinga	8/140 (5.71)	2.89 (1.17–7.10)*	2.84 (1.07–7.54)*
Fula	14/177 (7.91)	4.09 (1.89–8.87)***	4.17 (1.86–9.35)***
Mista	3/31 (9.68)	5.10 (1.37–18.93)*	4.84 (1.25–18.8)*
Weight (kg)[b]			
41–64	9/388 (2.32)	1	1
65–75	11/364 (3.02)	1.31 (0.54–3.20)	1.42 (0.54–3.68)
76–130	24/348 (6.90)	3.12 (1.43–6.81)***	3.40 (1.47–7.90)**
HIV status			
HIV negative	38/934 (4.1)	1	
HIV 1,2,Dc	7/169 (4.1)	1.02 (0.45–2.32)	ND[d]

Notes
a Adjusted for gender, age, education, ethnic origin, and weight (categorised variables).
b Weight divided into tertiles based on distribution among non-diabetic individuals.
c Including 3 HIV-1 positive individuals, 3 HIV-2 positive individuals and 1 HIV-1+HIV-2 dually infected individual (HIV-D).
d Not done.
**p<0.05; **p<0.01; ***p<0.001. CI, confidence interval.*

Acknowledgements

The listed authors and the members of the SWEGUB CORE group, (including Babetida N'Buna, Antonio Biague, Ansu Biai, Cidia Camara, Joakim Esbjörnsson, Marianne Jansson, Sara Karlson, Jacob Lopatko Lindman, Patrik Medstrand, Fredrik Månsson, Hans Norrgren, Angelica A. Palm, Gülsen Özkaya Sahin, and Zacarias Jose da Silva) are indebted to the staff of the Police Clinics and the National Public Health Laboratory in Bissau, Guinea-Bissau. The study was funded by the Department for Research Cooperation at the Swedish International Development Agency. HemoCue kindly provided equipment for RBG analysis.

Author declarations

The authors confirm that they have no competing interests to declare and that no animals were used in the research. Informed consent was required from patients. The study was approved by the Regional ethical board in Lund, Sweden and by the Ministry of Health, Guinea-Bissau. Research Ethics Committee protocol documents have been submitted to the publisher. All study participants gave their informed consent prior to their inclusion in the study.

References

1. Peer N, Kengne A-P, Motala AA, et al. Diabetes in the Africa region: an update. *Diab Res Clin Pract* 2014; 103: 197–205.
2. International Diabetes Foundation (IDF) 2014. *Diabetes Atlas* 2014. Brussels, Belgium: IDF, 2014.
3. Abubakari AR, Lauder W, Jones MC, et al. Prevalence and time trends in diabetes and physical inactivity among adult West African populations: the epidemic has arrived. *Public Health* 2009; 123: 602–14.
4. Haraldsdottir TL, Rudolf F, Bjerregaard-Andersen M, et al. Diabetes mellitus prevalence in tuberculosis patients and the background population in Guinea-Bissau: a disease burden study from the capital Bissau. *Trans R Soc Trop Med Hyg* 2015; 109: 400–7.
5. Esbjörnsson J, Månsson F, Kvist A, et al. Inhibition of HIV-1 disease progression by contemporaneous HIV-2 infection. *New Eng J Med* 2012; 367: 224–32.
6. Norrgren H, Da Silva Z, Biague A, et al. Clinical progression in early and late stages of disease in a cohort of individuals infected with human immunodeficiency virus-2 in Guinea-Bissau. *Scand J Infect Dis* 2003; 35: 265–72.
7. American Diabetes Association (ADA). Standards of medical care in diabetes. *Diabetes Care* 2015; 38 (Suppl. 1).
8. Inzucchi SE. Diagnosis of diabetes. *N Engl J Med* 2012; 367: 542–50.
9. Gomez-Perez FJ, Aguilar-Salinas CA. HbA1c for the diagnosis of diabetes mellitus in a developing country – a position article. *Arch Med Res* 2010; 41: 302–8.