

Increasing prevalence of diabetes mellitus and impaired fasting glucose in the Seychelles, a rapidly developing country



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1. Objective

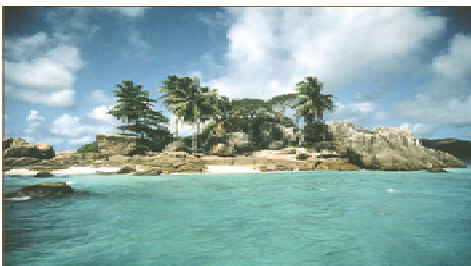
To compare the prevalence of diabetes mellitus (DM) and impaired fasting glucose (IFG) in 1989 and 2004 in the population of the Seychelles, a rapidly developing country.

2. Methods

Population-based surveys were attended by 1081 persons aged 25-64 in 1989 (86.4% participation rate) and 1255 in 2004 (80.2%). Fasting blood glucose (FBG) was determined in both surveys. In 2004, an oral glucose tolerance test was performed if FBG was ≥ 5.6 mmol/l and diabetes not previously diagnosed (n=330).

4. Conclusion

The prevalence of diabetes increased markedly during the past 15 years, which paralleled a sharp increase in the prevalence of overweight. High prevalences of IFG and/or IGT suggest that DM prevalence could further increase in the near future.



3. Results

In 2004, the age-standardized prevalence of DM (under treatment, FBG ≥ 7.0 or 2h-BG ≥ 11.1) was 11.6% (95%CI: 8.9-14.2) in men and 11.8% (9.3-14.2) in women aged 25-64. The prevalence of impaired glucose tolerance (IGT, 2h-BG: 7.8-11.0) was 11.2% in men and 9.7% in women. The prevalence of IFG (FBG: 5.6-7.0) was 30.3% in men and 18% in women. DM, IGT and IFG were strongly associated with overweight and waist circumference. Based on FBG only, the prevalence of DM increased from 6.2% in 1989 to 9.6% in 2004, with 31% and 56% of them being aware of having DM. In the same 15-year period, mean body mass index and blood insulin concentration increased largely.

	Men		Women		All	
	2004	1989	2004	1989	2004	1989
n	568	513	687	568	1255	1081
Age (years)	42.1 (41.2-43.0)	41.7 (40.7-42.6)	41.9 (41.0-42.7)	41.6 (40.7-42.5)	42.0 (41.4-42.6)	41.6 (41.0-42.3)
BMI (kg/m ²)	25.5 (25.1-25.9)	23.3 (23.0-23.6)	28.1 (27.6-28.6)	25.9 (25.4-26.4)	26.9 (26.6-27.3)	24.6 (24.3-24.9)
BMI < 25 kg/m ² (%)	48.1 (44.0-52.2)	72.2 (68.4-76.2)	31.8 (28.3-35.3)	49.0 (44.8-53.1)	40.0 (37.3-42.7)	60.6 (57.7-63.5)
BMI 25-30 kg/m ² (%)	36.9 (32.9-40.9)	23.5 (19.9-27.3)	33.1 (29.6-36.7)	28.3 (24.6-32.0)	35.0 (32.4-37.7)	25.9 (23.4-28.6)
BMI > 30 kg/m ² (%)	15.0 (12.1-17.9)	4.3 (2.5-6.1)	35.1 (31.6-38.7)	22.7 (19.3-26.2)	25.1 (22.7-27.5)	13.5 (11.5-15.6)
Waist circ. (WC) (cm)	89.1 (88.2-90.1)	-	90.3 (89.2-91.3)	-	89.7 (89.0-90.4)	-
WC < 80/94cm (%)	64.5 (60.5-68.4)	-	24.3 (21.1-27.6)	-	44.4 (41.7-47.2)	-
WC 80-88/94-102cm (%)	22.4 (18.9-25.8)	-	22.6 (19.4-25.7)	-	22.5 (20.2-24.8)	-
WC > 88/102cm (%)	13.1 (10.3-15.9)	-	53.1 (49.4-56.8)	-	33.1 (30.5-35.7)	-
Hip circ. (HC) (cm)	99.5 (98.7-100.3)	-	104.0 (103.0-105.0)	-	101.8 (101.1-102.4)	-
WC / HC (ratio)	0.90 (0.89-0.90)	-	0.87 (0.86-0.87)	-	0.9 (87.7-88.4)	-
Bodyfat (%)	19.1 (18.6-19.7)	-	33.1 (32.5-33.7)	-	26.2 (25.6-26.7)	-
Fasting glucose (mmol/l)	6.0 (5.9-6.2)	5.2 (5.1-5.4)	5.7 (5.6-5.9)	5.2 (5.1-5.4)	5.9 (5.8-6.0)	5.2 (5.1-5.3)
Fasting insulin (μ U/ml)	13.5 (12.6-14.5)	8.6 (7.9-9.2)	16.1 (15.2-17.1)	10.4 (9.3-10.9)	14.8 (14.2-15.5)	9.5 (9.1-9.9)
HOMA IR	3.9 (3.5-4.3)	2.0 (1.8-2.2)	4.3 (4.0-4.6)	2.5 (2.3-2.6)	4.1 (3.8-4.3)	2.2 (2.1-2.4)

Table 1: Age standardized participant characteristics (mean or % with their 95% confidence interval).

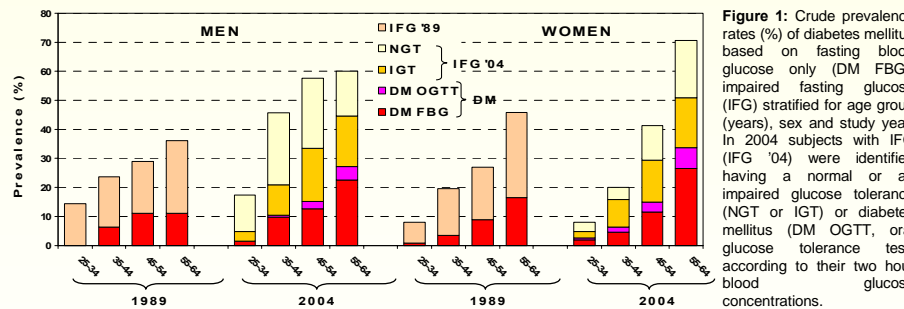


Figure 1: Crude prevalence rates (%) of diabetes mellitus based on fasting blood glucose only (DM FBG), impaired fasting glucose (IFG) stratified for age group (years), sex and study year. In 2004 subjects with IFG (IFG '04) were identified having a normal or an impaired glucose tolerance (NGT or IGT) or diabetes mellitus (DM OGTT, oral glucose tolerance test) according to their two hour blood glucose concentrations.

	Diabetes mellitus vs. NFG		IFG and IGT vs. NFG		IFG and NGT vs. NFG	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
BMI (kg/m ²)	1.1 (1.08-1.16)	<0.001	1.1 (1.07-1.14)	<0.001	1.1 (1.06-1.13)	<0.001
Normal weight (BMI:19-22 kg/m ²)	1.0		1.0		1.0	
High normal weight (BMI:23-25 kg/m ²)	3.6 (1.52-8.38)	0.003	1.6 (0.72-3.60)	0.241	1.2 (0.58-2.40)	0.644
Overweight (BMI:25-29 kg/m ²)	5.3 (2.52-10.95)	<0.001	3.2 (1.72-5.94)	<0.001	2.1 (1.25-3.61)	0.005
Obesity (BMI:30-35 kg/m ²)	9.9 (4.55-21.65)	<0.001	4.2 (2.12-8.39)	<0.001	2.6 (1.36-4.98)	0.004
Obesity (BMI>35 kg/m ²)	12.0 (5.09-28.46)	<0.001	7.1 (3.29-15.20)	<0.001	4.7 (2.21-9.82)	<0.001
Waist circumference (WC) (cm)	1.1 (1.06-1.09)	<0.001	1.0 (1.03-1.06)	<0.001	1.1 (1.04-1.07)	<0.001
WC < 80 / 94cm (%)	1.0		1.0		1.0	
WC 80-88 / 94-102cm (%)	3.2 (1.77-5.63)	<0.001	2.6 (1.50-4.42)	<0.001	1.8 (1.10-3.01)	<0.001
WC > 102 / 88cm (%)	8.6 (4.81-15.29)	<0.001	4.5 (2.66-7.70)	<0.001	3.2 (1.87-5.35)	<0.001
Family history of diabetes (1st degree)	2.3 (1.58-3.32)	<0.001	1.6 (1.06-2.30)	0.026	1.1 (0.72-1.65)	0.694

Table 3: Results of age and sex adjusted univariate logistic regression analysis, dependent variables: diabetes mellitus, impaired fasting glucose (IFG) with impaired glucose tolerance (IGT) and IFG with normal glucose tolerance (NGT) compared to normoglycemic subjects.

Status	Group	2004		1989	
		n	% (95% CI)	n	% (95% CI)
FBG ≥ 7.0 mmol/l (DM)*	All	149	9.6 (7.9-11.2)	84	6.2 (4.7-7.6)
	Men	69	10.0 (7.5-12.5)	39	6.2 (4.1-8.3)
	Women	80	9.1 (6.9-11.2)	45	6.1 (4.2-8.1)
Aware of DM*	All	83	5.1 (3.8-6.3)	26	1.7 (1.0-2.5)
	Men	32	4.3 (2.6-5.9)	10	1.4 (0.4-2.5)
	Women	51	5.8 (4.1-7.6)	16	2.0 (0.9-3.2)
Unaware of DM	All	66	4.5 (3.3-5.6)	58	4.4 (3.2-5.7)
	Men	37	5.7 (3.8-7.6)	29	4.8 (2.9-6.6)
	Women	29	3.3 (1.9-4.6)	29	4.1 (2.5-5.7)
FBG 5.6 - 7.0 mmol/l	All	330	24.1 (21.7-26.5)	201	16.9 (14.6-19.1)
	Men	183	30.3 (26.5-34.1)	97	17.8 (14.5-21.1)
	Women	147	18.0 (15.1-20.8)	104	16.0 (13.0-19.0)
2hPG ≥ 11.1 mmol/l (DM)	All	35	2.1 (1.3-2.9)	-	-
	Men	12	1.6 (0.6-2.6)	-	-
	Women	23	2.6 (1.9-3.9)	-	-
2hPG 7.8 - 11.1 mmol/l (IFG & IGT)	All	150	10.4 (8.8-12.2)	-	-
	Men	73	11.2 (8.5-13.7)	-	-
	Women	77	9.7 (7.6-12.1)	-	-
2hPG < 7.8 mmol/l (IFG & NGT)	All	145	11.6 (9.8-13.4)	-	-
	Men	98	17.5 (14.4-20.7)	-	-
	Women	47	5.7 (4.0-7.4)	-	-
FBG < 5.6 mmol/l	All	776	66.3 (63.7-68.9)	796	76.9 (74.4-79.5)
	Men	316	59.7 (55.7-63.8)	377	76.0 (72.3-79.7)
	Women	460	72.9 (69.6-76.3)	419	77.9 (74.5-81.3)

*In 2004, 10 women and 4 men were aware of diabetes but had a FBG < 7.0 mmol/l, in 1989 there were 2 men and 3 women respectively

Table 2: Age standardized prevalence rates (n and % with their 95% confidence interval) of known (aware) and newly diagnosed (unaware) diabetes mellitus (DM) and impaired and normal fasting glucose (NFG and IFG) by sex in 1989 and 2004. Prevalence of impaired and normal glucose tolerance (NGT and IGT) was included in 2004.

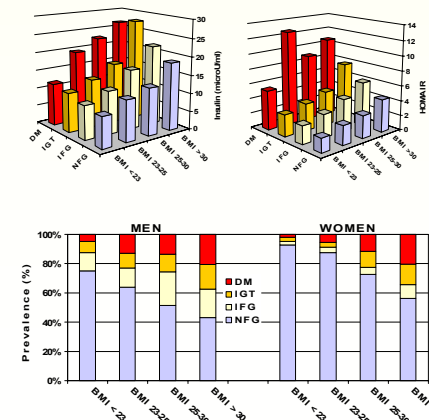


Figure 2 A and B: Mean insulin concentration (A) and HOMA-IR index (B) stratified by body mass index (BMI) and impairment of glucose metabolism in 2004.

Figure 3: Age adjusted prevalence rates (%) of diabetes mellitus (DM) and impaired fasting glucose (IFG) with normal or impaired glucose tolerance (NGT or IGT) in 2004, stratified by BMI category.