

# Prevalence of Impaired Fasting Glucose in Healthy Middle-Aged Adults: Insight from the Primary cARe AuDIt of Global risk Management (PARADIGM) Study

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## BACKGROUND

- The PARADIGM study is an observational registry, the primary objective of which is to evaluate primary care physician assessment of global cardiovascular (CV) risk in healthy individuals
- In 2009/2010, primary care physician investigators from 105 sites across Canada prospectively enrolled 3015 healthy middle-aged adults in PARADIGM to assess the prevalence of CV risk factors and trends in CV risk assessment using traditional biochemical and novel inflammatory and structural biomarkers of atherosclerosis
- Impaired fasting glucose (IFG) is associated with an increased risk of type 2 diabetes, cardiovascular disease, and all-cause mortality
- We assessed the prevalence of IFG and associated clinical characteristics in healthy, middle-aged subjects in the PARADIGM study

## METHODS

- The PARADIGM study enrolled 3015 generally healthy, middle-aged patients in an observational registry
- Subjects with diabetes or vascular disease were excluded, as were subjects receiving lipid-lowering therapy
- PARADIGM represents a pure primary prevention cohort
- This analysis reports on those subjects who were found to have fasting blood glucose level > 6 mmol/L, within this cohort

## Inclusion Criteria

- Men ≥40y, women ≥50y
- Absence of known high Framingham Risk Score
- Absence of known type 1 or type 2 diabetes
- Absence of lipid lowering treatment (current or past)
- No previous history of atherosclerosis (angina, TIA, myocardial infarction, stroke, peripheral arterial disease)
- Willingness to give informed consent

## PARADIGM STUDY OBJECTIVES

- To evaluate primary care physician assessment of global cardiovascular risk in healthy individuals
- To determine the prevalence of IFG and associated clinical characteristics in healthy, middle-aged subjects
- To evaluate the risk category of subjects with IFG based on the total CV Framingham Risk Score

## STUDY SETTING

- This analysis reports on 3003 PARADIGM subjects with IFG (11.7%) compared to those without IFG (88.3%)
- Subjects with no fasting blood sugar levels (n=12) were excluded from the analysis

## RESULTS

- There were 53 patients out of 3003 in the PARADIGM study who had fasting blood glucose ≥ 7 at baseline, but they were non-diabetic at the time of enrolment
- When these subjects were excluded from the analyses, the results were no different

Figure 1: Prevalence of impaired fasting glucose in the PARADIGM cohort

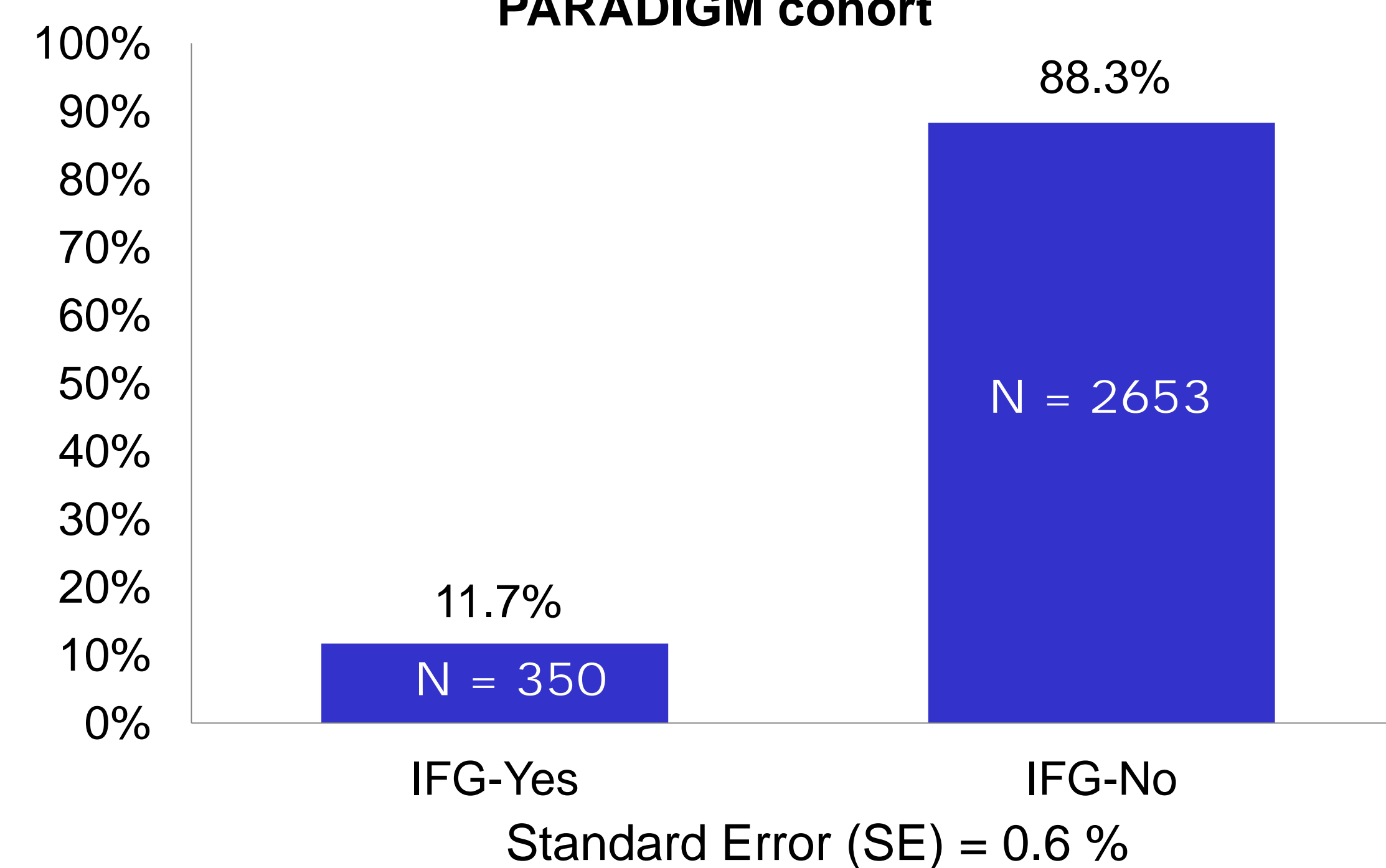
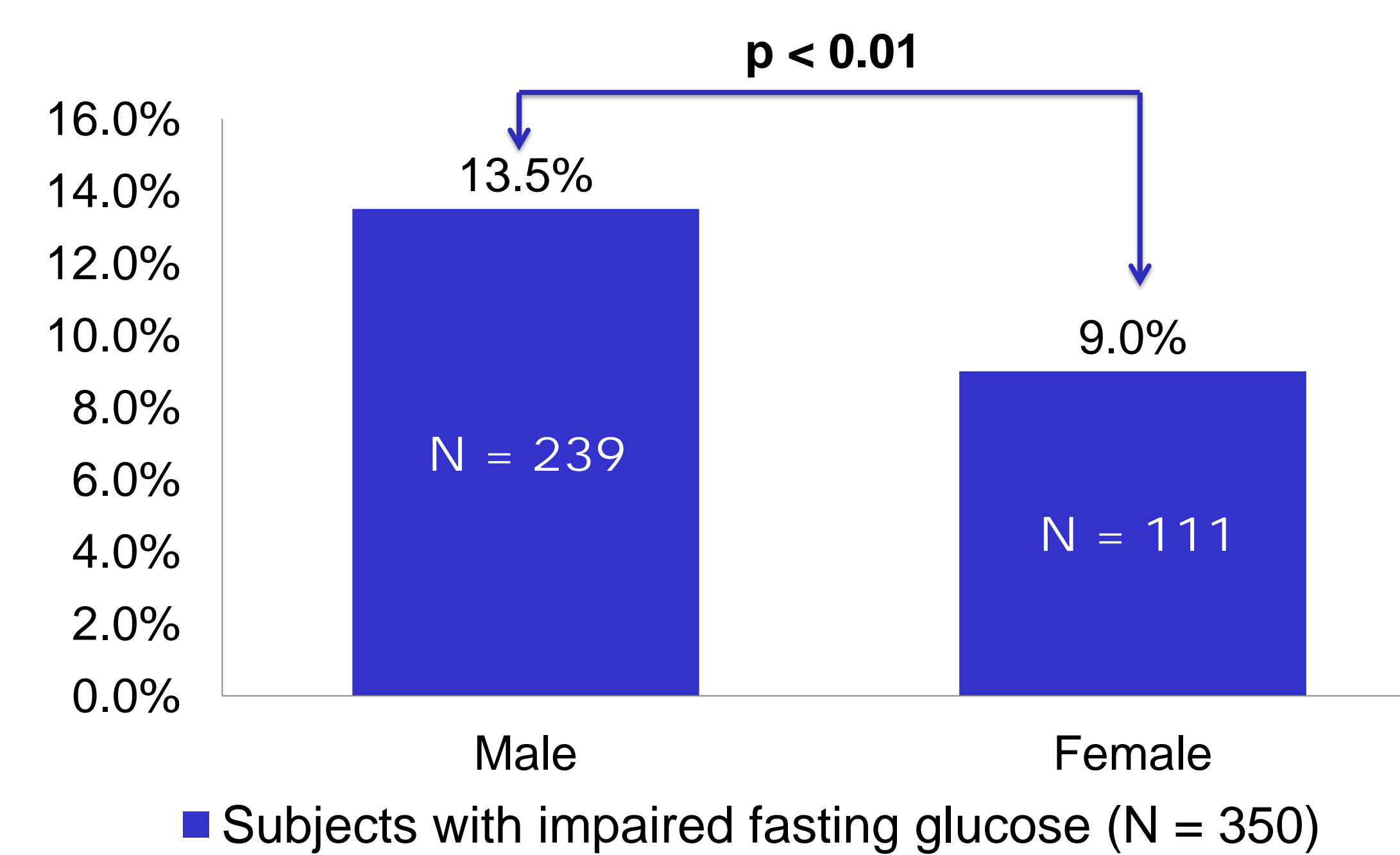


Figure 2: IFG prevalence by gender in the PARADIGM cohort



## RESULTS

Table 1. Clinical variables

Variable (% (n) or mean ± SD)	IFG - Yes (n=350)	IFG - No (n=2653)	p-value
Age ±SD†	56.8y ± 8.4	56.2y ± 8.4	p=ns
Male	68.3% (239)	57.6% (1527)	p<0.001
Hypertension	41.7% (146)	28.8% (765)	p<0.00001
Smoking Hx* (P/C)**	42% (147)	33.7% (893)	p<0.01
Family Hx CVD***	25% (87)	24.3% (644)	p=ns
BMI****(kg/m <sup>2</sup> )	30.4 ± 6.5	27.4 ± 5	p<0.00001
WC†(cm)	101.6 ± 15.4	93.9 ± 13.1	p<0.00001
Metabolic syndrome	61.7% (216)	24.7 (655)	p<0.00001

† Standard deviation  
\*Hx (history)  
\*\*P/C (past or current smoker)  
\*\*\* CVD (cardiovascular disease)  
\*\*\*\* BMI (body mass index)  
† WC (waist circumference)

Table 2. Lab results

Variable (% (n) or mean ± SD)	IFG - Yes (n=350)	IFG - No (n=2653)	p-value
TC*(mmol/L)	5.7 ± 1.1	5.6 ± 1.0	p=ns
LDL**(mmol/L)	3.6 ± 0.9	3.6 ± 0.8	p=ns
HDL***(mmol/L)	1.3 ± 0.4	1.4 ± 0.4	p<0.00001
TG****(mmol/L)	1.9 ± 1.2	1.5 ± 1.0	p<0.00001
HbA1c	6.1%	5.7%	p<0.00001
Fasting glucose (mmol/L)	6.7 ± 1.0	5.2 ± 0.5	p<0.00001
hsCRP (mg/L)	4.2 ± 4.9	2.8 ± 4.1	p<0.00001

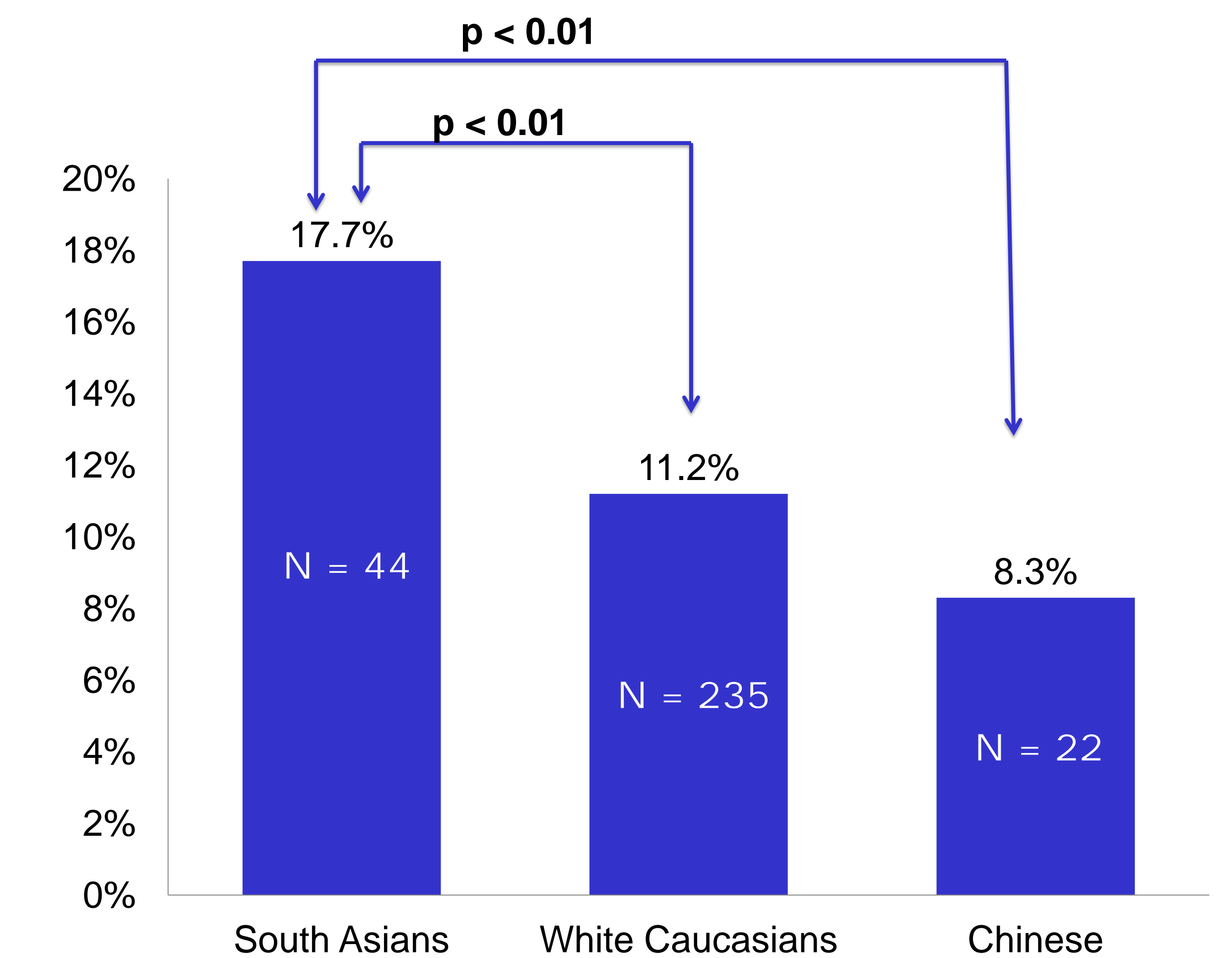
\*TC (total cholesterol)  
\*\*LDL (low density lipoprotein)  
\*\*\* HDL (high density lipoprotein)  
\*\*\*\* TG (triglycerides)

Table 3. Categories of Risk by Total Cardiovascular Framingham Risk Score

Variable % (n)	IFG - Yes (n=350)	IFG - No (n=2653)	p-value
Mean total CV FRS	18.8%	14.1%	p<0.00001
Low FRS	25.1% (88)	46.2% (1224)	p<0.00001
Intermediate FRS	39.1% (137)	33.2% (880)	p<0.00001
High FRS	35.7% (125)	20.7% (548)	p<0.00001

## RESULTS

Figure 3: Prevalence of impaired fasting glucose in various ethnic groups



## SUMMARY AND CLINICAL IMPLICATIONS

- Approximately 12% of otherwise healthy middle-aged Canadians have IFG
- The majority of subjects with IFG have an increased FRS, and over one third are at high CV risk, even in the absence of diabetes
- The risk of IFG is substantially higher in South Asians, and lowest in the Chinese
- Screening for IFG may uncover otherwise healthy subjects who are at substantial risk for CVD and who may benefit from preventive treatments

## ACKNOWLEDGEMENTS

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