# DIFFERENT STROKES FOR DIFFERENT FOLKS: Epidemiology of Cerebrovascular Diseases amongst Chinese-Canadians residing in Toronto

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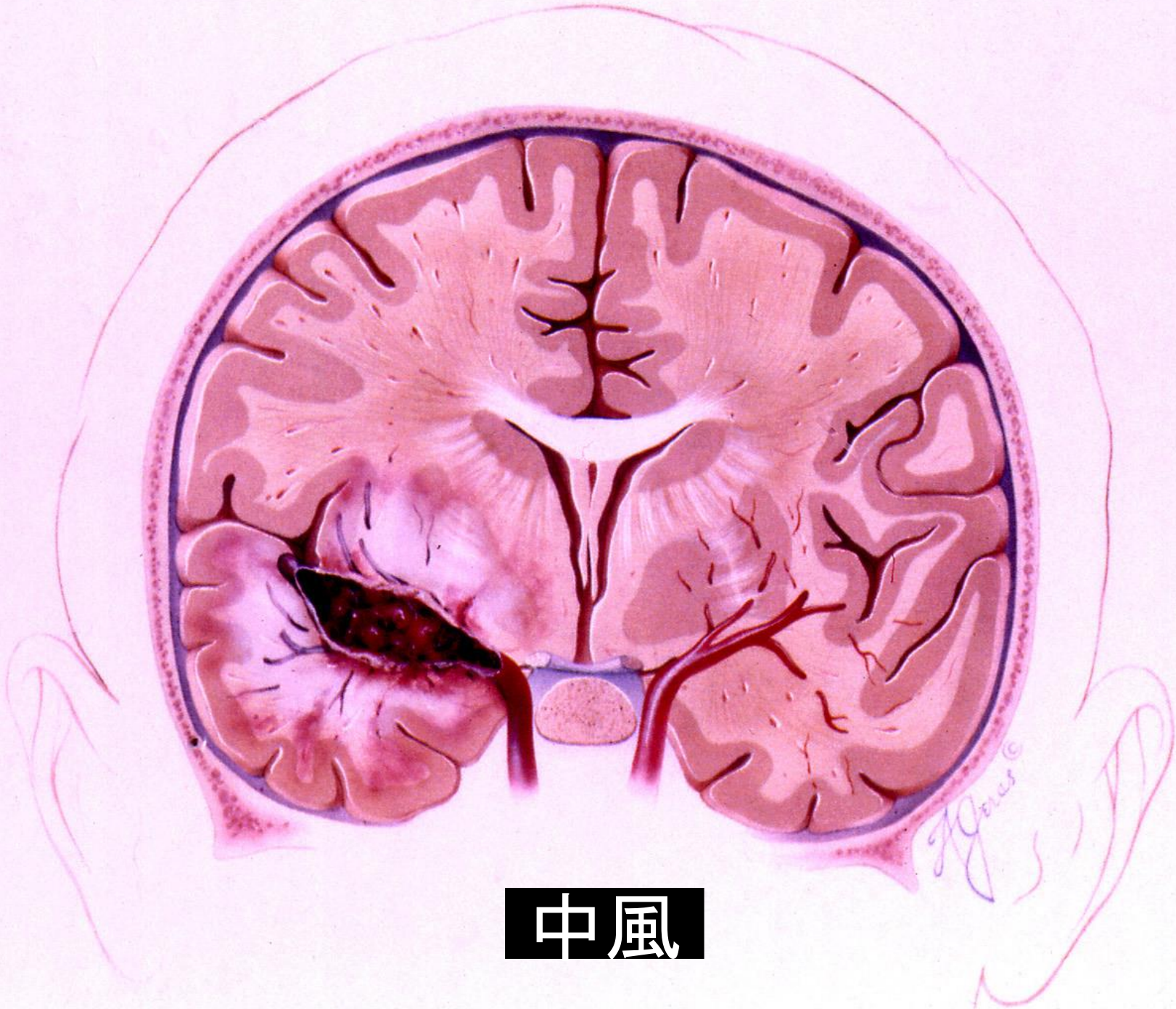
# Disclosure

- Dr. Chu has received unrestricted research and educational grants from Pfizer Canada, Novartis Canada, Biogen Idec Inc. and Merck Canada.
- Received grants for summer student research scholarship from the Heart & Stroke Foundation of Ontario in 1999-2000.
- Current Research Chair of the Chinese Canadian Council, in support of Heart and Stroke Foundation of Canada.
- No conflict of interests relating to this presentation.

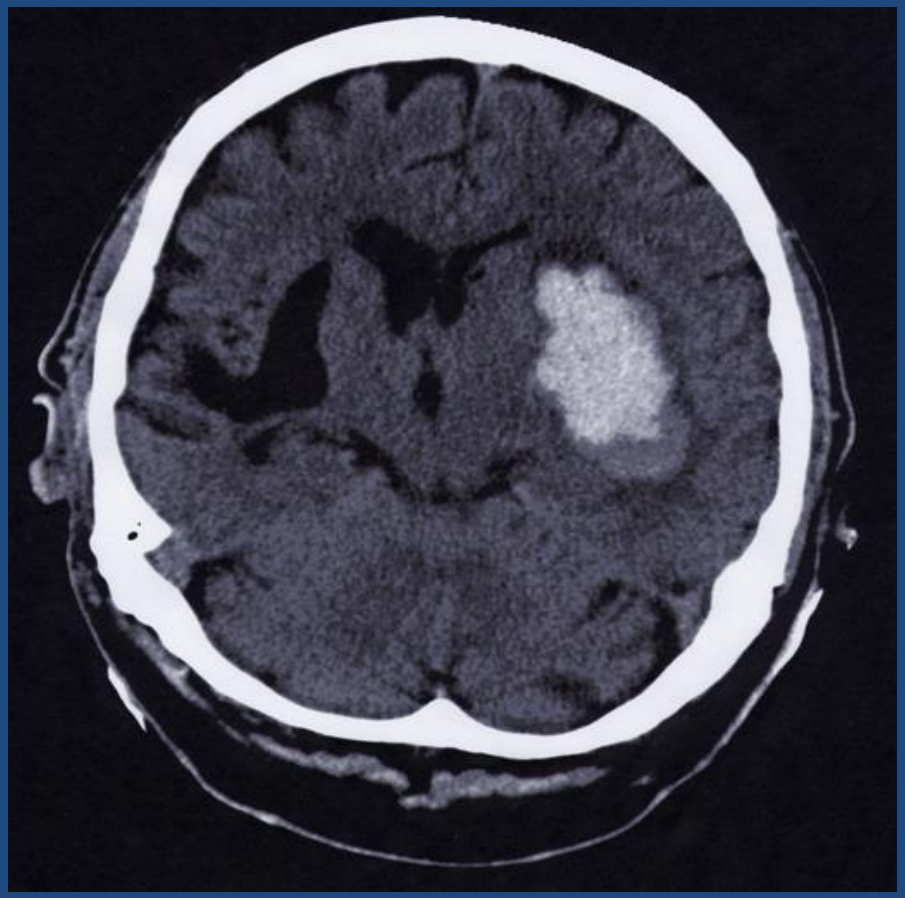
# Learning Objectives

- To review the scientific data collected over the past 30 years on the stroke epidemiology of Chinese living in Canada (Toronto).
- Current areas of research relating to Cerebrovascular disorders of Chinese Canadians with Type II diabetes in Toronto.
- What lies in the future for collaborative stroke research on Chinese living in North America ?



中風

64 yo man:
HBP + ACUTE L. BASAL GANGLIA ICH
10 years ago R. BASAL GANGLIA ICH



# IMPACT OF STROKE IN CANADA

- STROKE  is the third leading cause of death and # 1 cause of disabilities in adults.
- Annual stroke mortality is 14,000 and annual incidence is 50,000,  1 stroke every 10 minutes
- Annual prevalence is 426,000.
- Annual stroke cost = $3.6 Billion.
- For every 100 patients with stroke:

  15 dies  10 severely disabled

  40 mod. disabled  25 mildly disabled

  ONY 10 will fully recover

# Hypothesis

- Chinese living in North America have different stroke patterns and epidemiology than those living in Asia .
- There is an intimate interaction between genetics and environmental factors which dictate the specific stroke patterns and epidemiology for the Chinese.
- Successive generations of Chinese living in North America who follows the lifestyle of their adopted country will develop the stroke patterns similar to those who are born locally.

# Multi-Cultural CANADA

# Background

- Chinese is the largest visible minority group in Canada
- 2001 Stats Canada data

| | Total Chinese | Visible Minority (%) |
|---|---|---|
| Canada | 1,094700 | 27.5% |
| Toronto | 409,530 | 23.9% |
| Vancouver | 342,665 | 42.7% |

| Ethnicity groups in the Toronto CMA (2011)<br>Source: Statistics Canada 2011 Toronto CMA NHS Profile: Visible Minority | | Population | % |
|---|---|---|---|
| Ethnicity group | White / Aboriginal | 2,924,815 | 53.0 |
| | South Asian | 833,085 | 15.1 |
| | Chinese | 531,635 | 9.6 |
| | Black | 397,175 | 7.2 |
| | Filipino | 230,075 | 4.2 |
| | Latin American | 117,005 | 2.1 |
| | West Asian | 96,650 | 1.8 |
| | Southeast Asian | 90,990 | 1.6 |
| | Arab | 74,990 | 1.4 |
| | Korean | 61,300 | 1.1 |
| | Japanese | 20,015 | 0.4 |
| | Multiple minorities | 74,840 | 1.4 |
| | Other | 68,660 | 1.2 |
| **Total population** | | **5,521,235** | **100** |

Concentrations of ethnic groups per Toronto CMA municipality are as follows, with the largest p
bold[32] (only percentages higher than 3% are included):

TORONTO STAR

**WEATHER** HIGH 12 C | PARTLY CLOUDY | **MAP S8**

**THURSDAY**, OCTOBER 26, 2017

> **CITY OF TORONTO** CENSUS

RICHARD LAUTENS/TORONTO STAR

**CHANGING FACE OF A CITY** Toronto's Yonge-Dundas Square reflects the new reality of a culturally diverse country where an increasing number of people identify as a visible minority.

# A majority of Torontonians now identify themselves as visible minorities

# 51.5%

New census data paints a portrait of a changing country, tells the story of who we are and what we cherish, and offers an opportunity to ask ourselves: how are we all going to get along?

**ALEX BALLINGALL**
OTTAWA BUREAU

OTTAWA—Most people in Canada's biggest city now identify as visible minorities, as new census data shows increasing diversity in Toronto and many of its neighbouring suburban areas.

More than half of respondents to the 2016 census in the City of Toronto — 51.5 per cent — said they're from visible minority communities, a milestone that was narrowly missed when 49 per cent identified that way in 2011.

The news comes as part of census data, released Wednesday, that paints a multifaceted portrait of a country where more than one in five people were born outside

Shree Paradkar

The colourful town square just got livelier.

Toronto is a minority majority city at last, fully 51.5 per cent of us identify as visible minorities and almost half, or 48.8 per cent, do so in the GTA.

"At last," not because this fulfills a dire take-over-the-country prophecy by "foreigners," but because in a capitalist society, this was inevitable.

stand race. In Toronto, for instance, should people of colour still be called visible minorities if they're not a minority any more?

This is a messy question with no easy answers. The largest minority group in the city, now, consists of people who identify as whites. The heterogenous rest are still a coalition of minority groups, a unifying factor being that they're not white. (This group of minorities does not include Indigenous peoples.) Ideally, humans would have no labels, but discrimination based on these identities exists; not acknowledging that

## CENSUS HIGHLIGHTS

> The census counted 1.67 million Indigenous people in Canada in 2016, about 4.9 per cent of the total population — a growth rate of 42.5 per cent over the last 10 years, four times the rate of the non-Indigenous population.

> 7.5 million people — about 21.9 per cent of the total population — reported being foreign-born individuals who immigrated to Canada. In 1971, the census reported that proportion at 22.3 per cent. Statistics Canada projects that proportion could reach between 25 and 30 per cent by 2036.

> Asia, including the Middle East, remains the largest source of recent immigrants to Canada at 61.8 per cent, followed by Africa at 13.4 per cent. Europe — once dominant in this cate-

Original Research on Office-based Patients

# Epidemiology of Cerebrovascular Disease Among Chinese-Canadians-a 10 Years Retrospective Study

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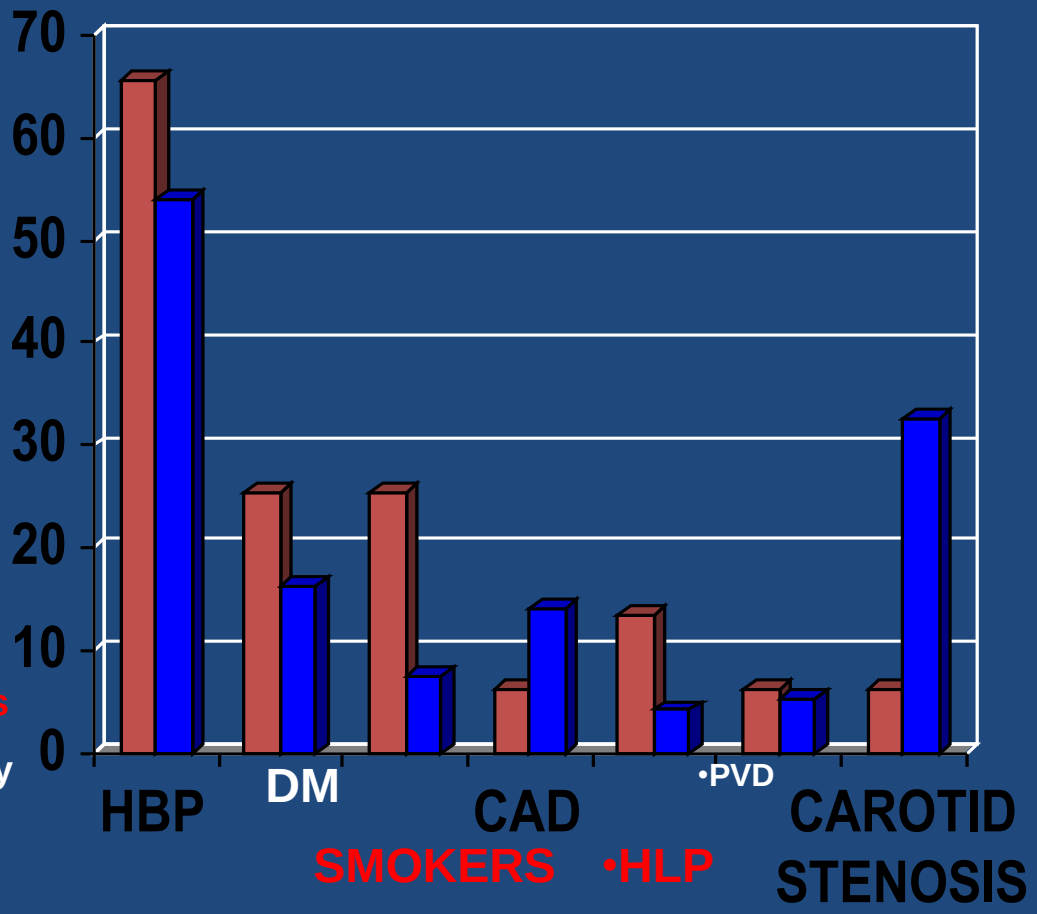
Arthur Chung and Jason K. Chu
(HSFO-CCC Summer Scholarship,1999)

Neurology Asia 2006; 11: 13--18

# • STROKE RISK FACTORS

## Chu etal: Neurology Asia 2006




•HBP = Hypertension

•DM = Diabetes Mellitus

•CAD = Coronary Artery Disease

•HLP = Hyperlipidemia

•PVD = Peripheral Vascular Disease

SMOKERS

P < 0.025

•HLP

•P < 0.05

P < 0.05 *

•Statistical significance

•Chi Square

Ophthalmic Artery
動脈

Basilar Artery
基底膜動脈

External Carotid Artery
外頸動脈

Right Common Carotid Artery
右共通頸動脈

Internal Carotid Artery
內頸動脈

Vertebral Artery
脊柱骨動脈

Innominate Artery
無名動脈

Left Subclavian Artery
左鎖骨下動脈

Aorta 大動脈

# CONCLUSIONS (4)

- Future long-term prospective study of the stroke risk factors of Chinese-Canadians in the format of national stroke data banks would be an important endeavor to prevent stroke occurrence in this population.
- Studies of stroke pattern of successive generations of Chinese-Canadians, similar to the Honolulu Heart Study would be essential in the understanding of how genetic and the environment influence stroke development. Currently, the ALLIANCE study will be examining a cohort of Chinese-Canadians (@600) prospectively on their CVS health status in Ontario.

# EPIDEMIOLOGY OF CEREBROVASCULAR DISEASES AMONG CHINESE-CANADIANS : A NINE-YEARS STUDY OF HOSPITALIZED PATIENTS

JY Chu, JV Tu, JK Chu, AG Chung
Trillium Health Centre and ICES
University of Toronto
38th CCNS Meeting, June 20th, 2003

# MEDICAL HISTORY

**HBP**

* P=0.04

**SMOKE**

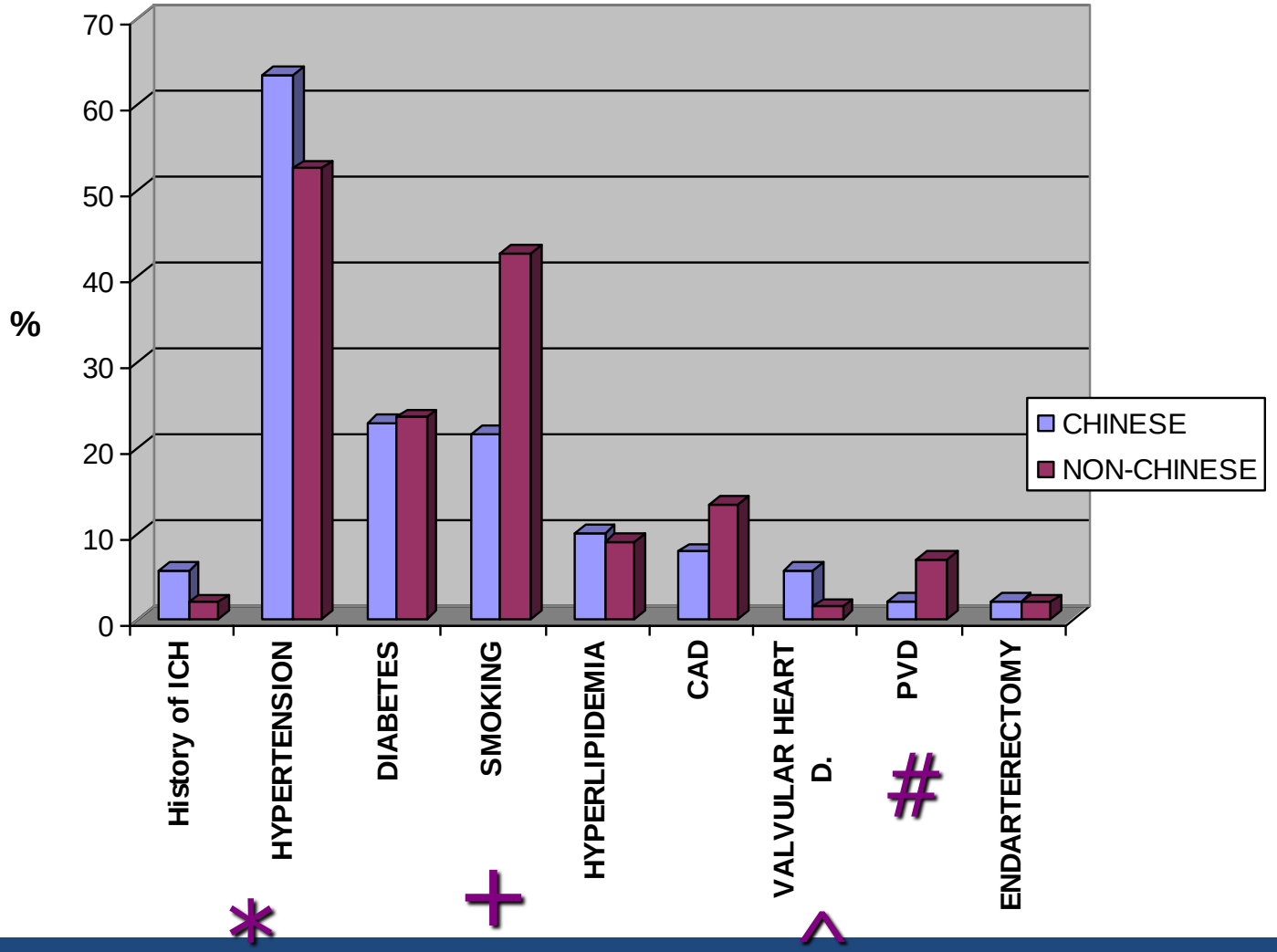
\+ P=0.0002

**VALVE HD**

^ p=0.06

**PVD**

\# p=0.04



# EPIDEMIOLOGY OF CEREBROVASCULAR DISEASE AMONG THE DIABETIC CHINESE-CANADIANS: A RETROSPECTIVE 10-YEAR CASE MIX STUDY

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BIT 4TH ANNUAL INTERNATIONAL CONGRESS OF CARDIOLOGY

GUANGZHOU, CHINA

DECEMBER 4TH, 2012

**Can J Diabetes 42 (2018) 94–99**

U of T NEUROLOGY

# BACKGROUND AND PURPOSE:

- An article published in Neurology Asia, 2006 by JYC provided impetus to confirm whether specific genetic or environmental differences exist within the Chinese community with diabetes mellitus (DM).
- Exposing distinctive epidemiologic and cerebrovascular patterns may bring forth effectively focused treatment and prevention.

# BACKGROUND AND PURPOSE:

- Our three retrospective study hypotheses were:
  - (1) Chinese-Canadians (CC) with stroke-history within the last 15 years are more frequently diabetic than Non-Chinese-Canadians (NCC)
  - (2) CC have higher frequency of intracranial small vessel disease (SVD) than NCC.
  - (3) Hypertensive CC with DM have poorer prognosis in stroke than NCC.

# METHODS:

- Patients were seen by JYC between 2001-2011 at his Toronto neurology clinic and at Brampton Civic Hospital of William Osler Health System
- All CC and NCC diabetic stroke patients who are or were under his care were selected by last name and birth country, then age and sex-matched
- Guideline values and prognosis stratification with hypertension severity grade were obtained from the World Health Organization (WHO).

# METHODS:

- The following data was collected:
  - (1) diabetic prevalence excluding patients with TIAs, subarachnoid and subdural haemorrhages.
  - (2) etiology and stroke type in DM patients.
  - (3) risk factor differences between DM CC and NCC.
  - (4) poor prognosis risk, HSG, and blood pressure values.

# METHODS:

- Odds ratios and unpaired two-sample t-testing were used to confirm significance ($P<0.05$).

- Through screening, a total of 184 patients met the criteria (111 NCC, 73 CC)

# RESULTS:

- **Significance confirmed (P<0.05):**
- 1) CC had higher DM and stroke incidence than NCC. Diabetic CC more frequently had SVD, specifically lacunar stroke.

- 2) SVD frequency was much greater than large vessel disease (LVD) in CC.

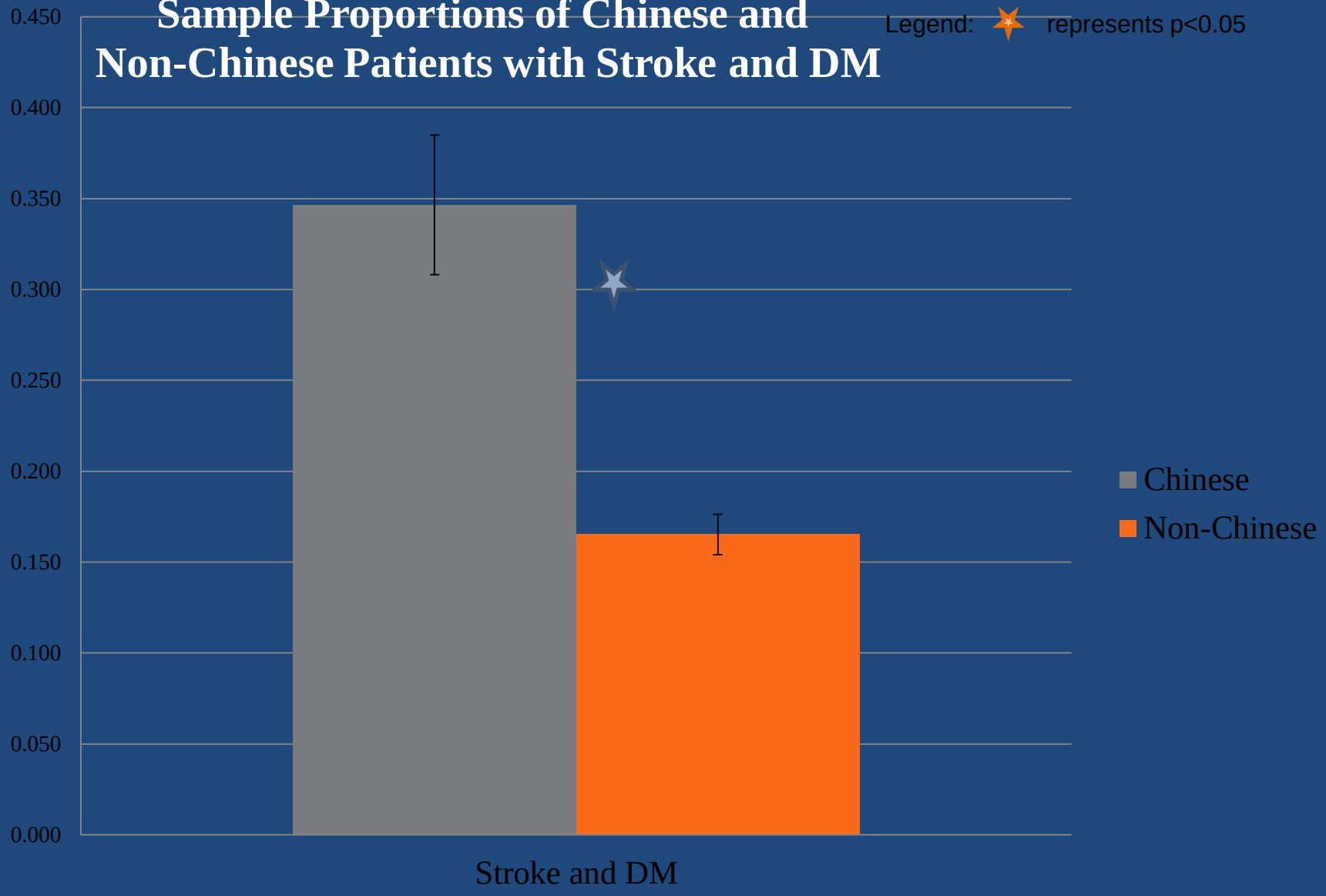
# RESULTS:

- **<u>Significance conformed (P<0.05):</u>**
- 3) The low-risk CC cohort was less likely than NCC to have poor prognosis:

  – However, high-risk CC seemed more likely had poor prognosis than NCC with near significance

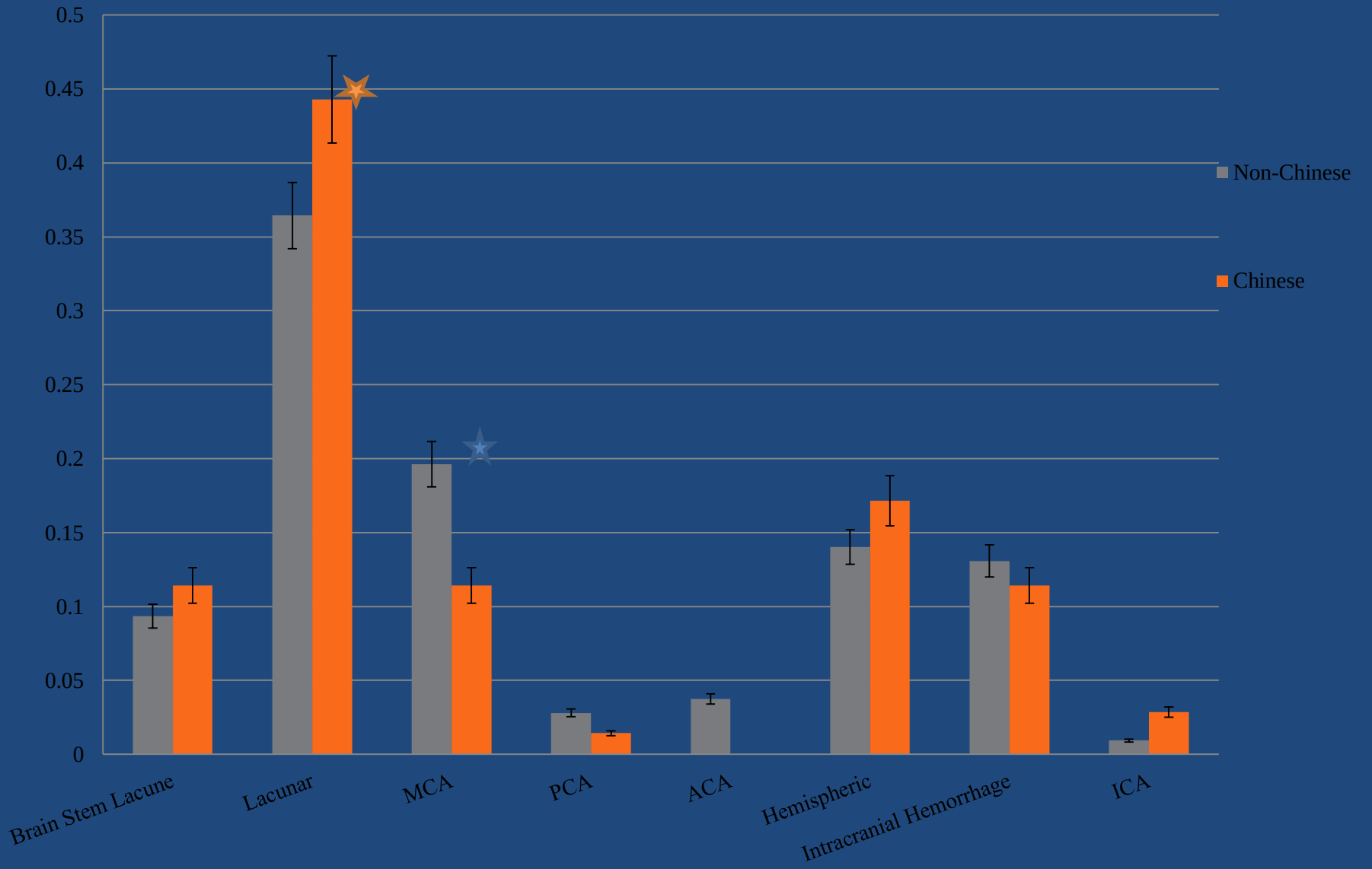
- NCC males had a significantly higher systolic blood pressure than CC males.

# Sample Proportions of Chinese and Non-Chinese Patients with Stroke and DM




*Data is expressed in proportion (number with stroke and DM/total patients of the particular ethnicity). N of Chinese-Canadian stroke patients = 101, N of Non-Chinese-Canadian patients = 926.*

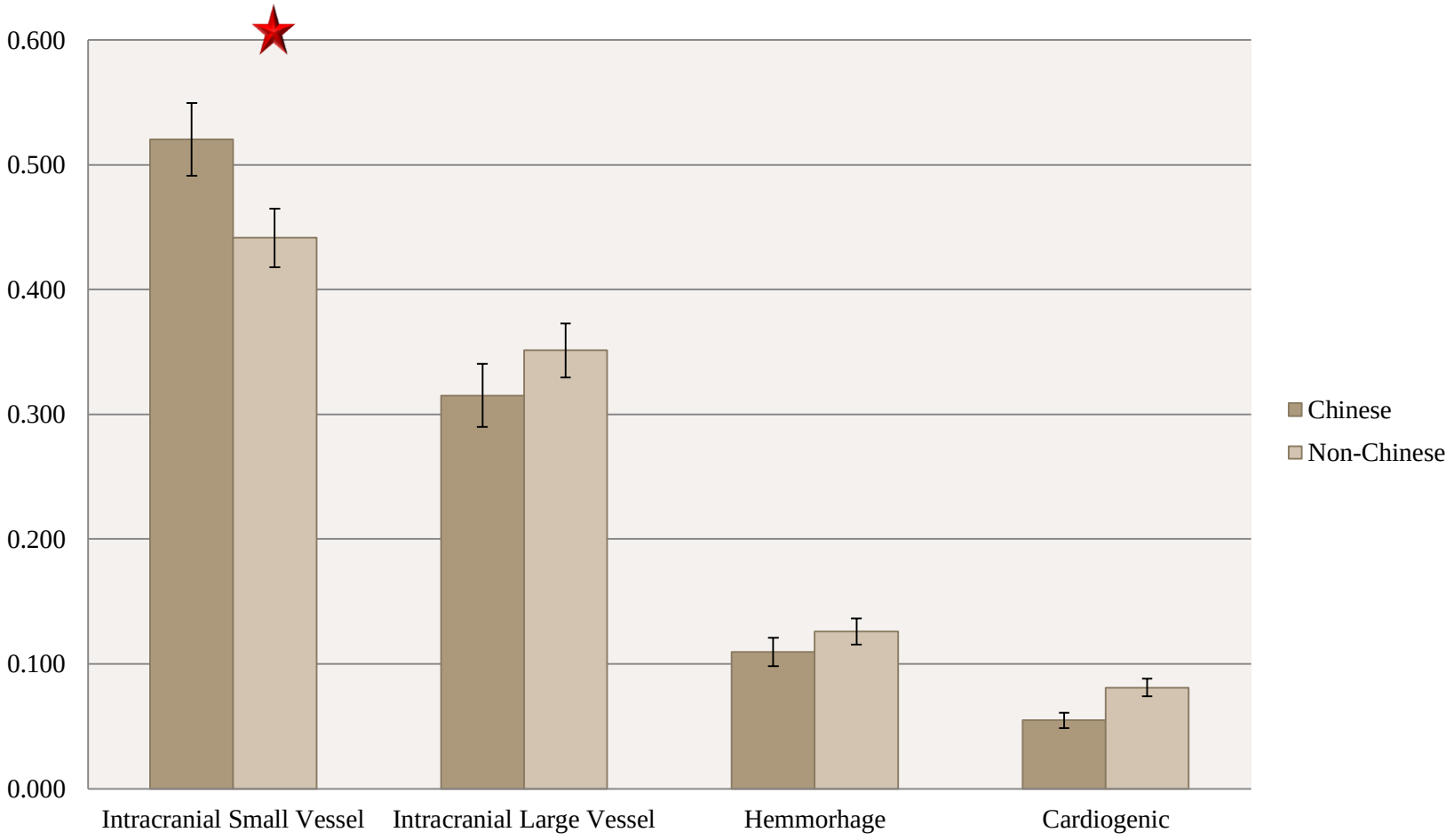
# Comparing Stroke Types: Chinese and Non-Chinese Population



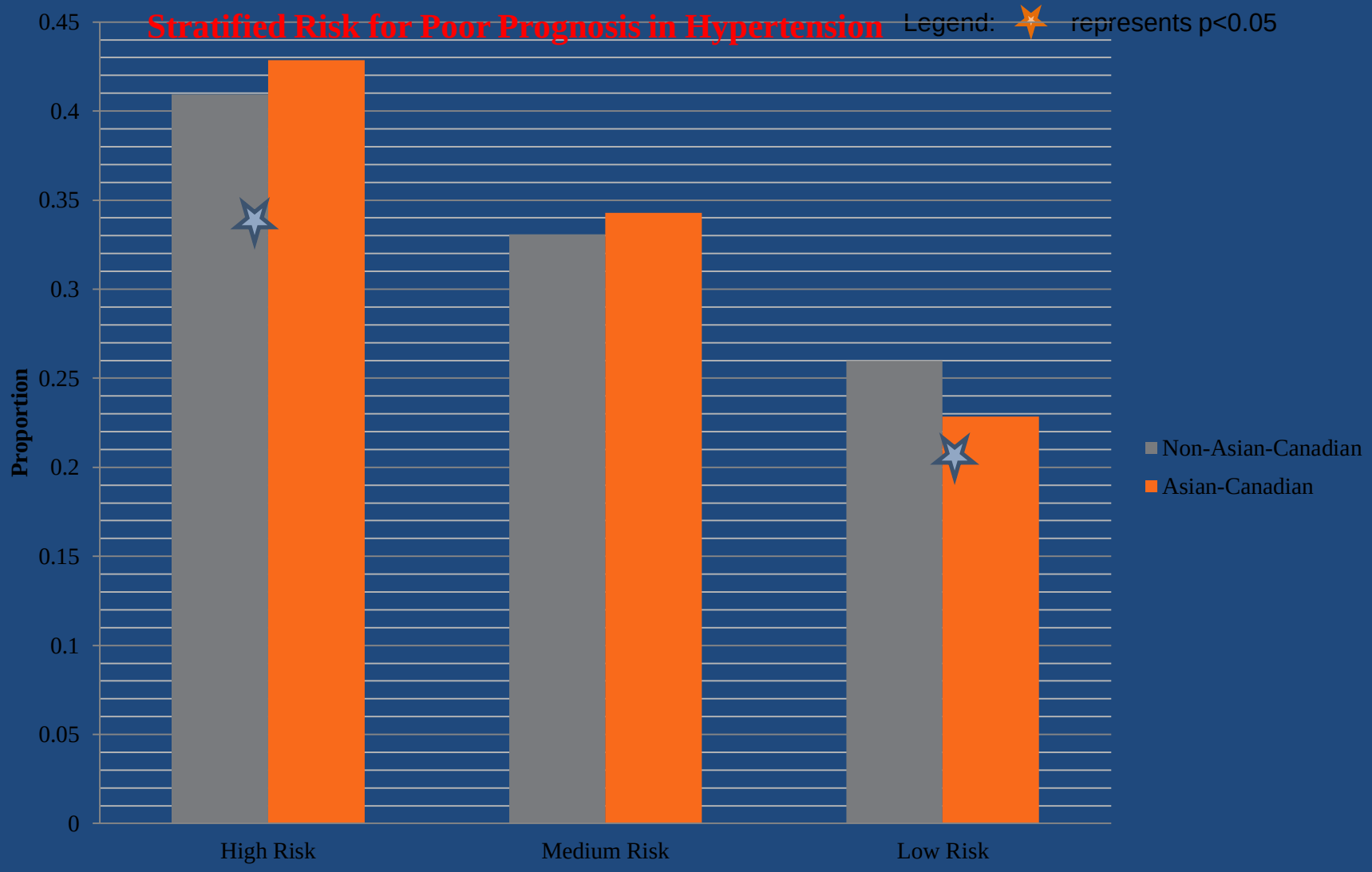

*Data is expressed in proportion (number with stroke type/total patients of the particular ethnicity). N(Chinese)=70, N(Non-Chinese)=107.*

# Comparing Differences of Stroke Etiology between Chinese and Non-Chinese DM Patients

*** P < 0.05**



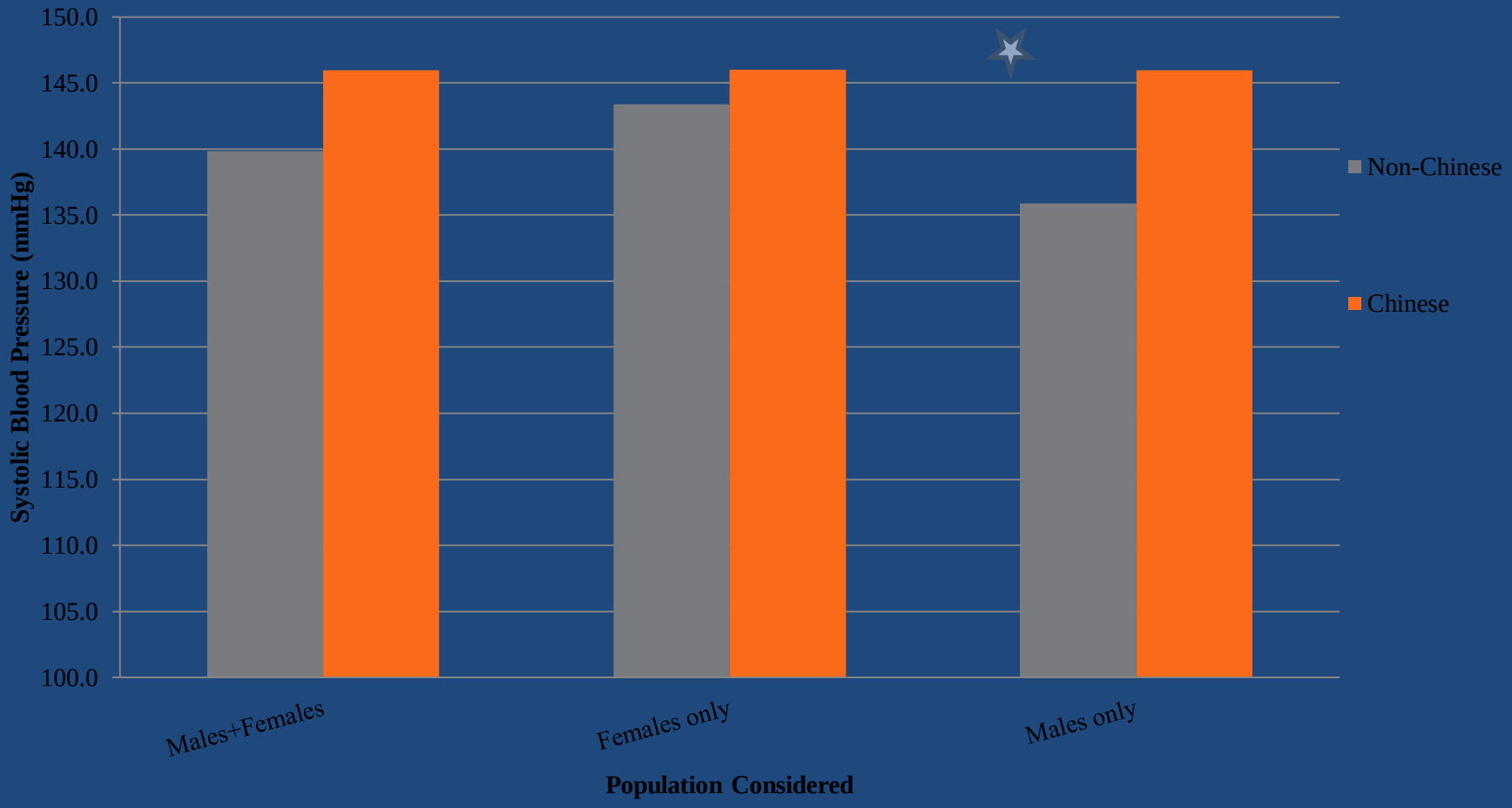

*Data is expressed in proportion (number with stroke etiology/total patients of the 4 categories). N(Chinese)=73, N(Non-Chinese)=111.*




*Data is expressed in proportion (number classified with risk/total patients for all 3 categories). N(Chinese)=35, N(Non-Chinese)=127.*

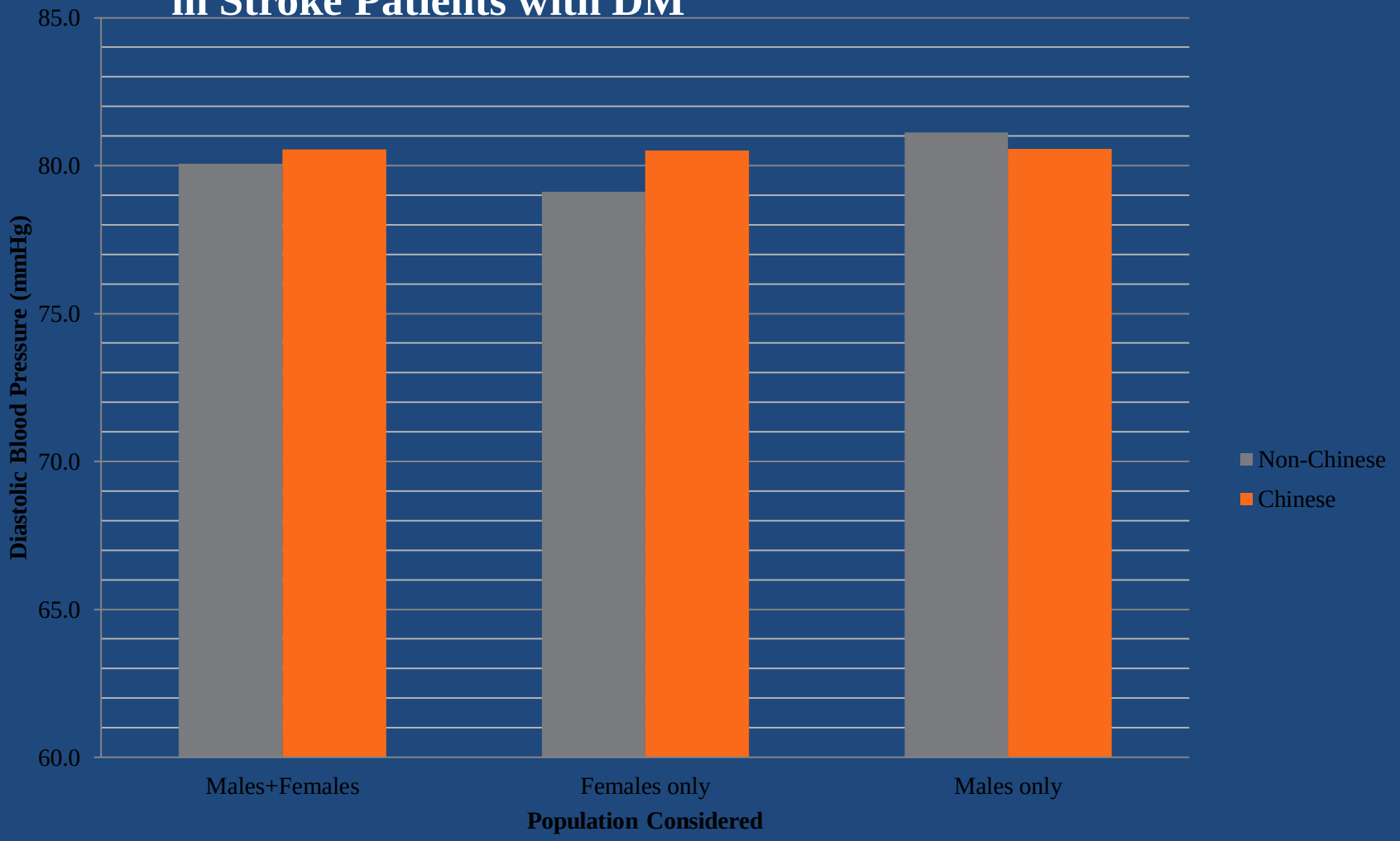
Legend: ★ represents p<0.05

# Systolic Blood Pressure Averages in Stroke Patients with DM



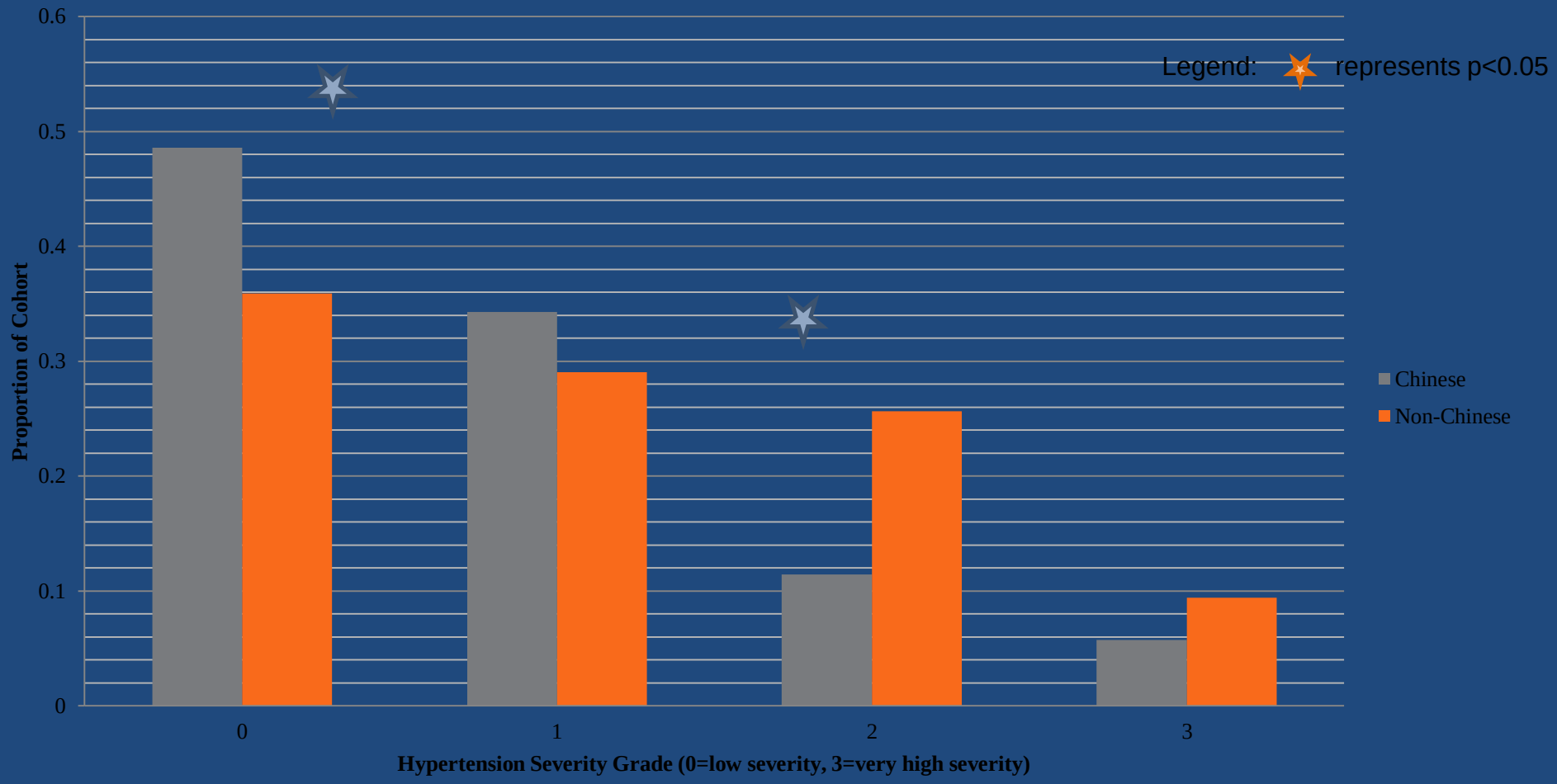

*Data is expressed in numerical value of millimoles of mercury. N(Chinese)=34, N(Non-Chinese)=115.*

# Diastolic Blood Pressure Averages in Stroke Patients with DM




*Data is expressed in numerical value of millimoles of mercury. N(Chinese)=34, N(Non-Chinese)=115.*

# Hypertension Severity Grade Differences in Stroke Patients with Diabetes




*Data is expressed in proportion (number classified with particular HSG/total patients for all 4 categories). N(Chinese)=34, N(Non-Chinese)=117.*

# RESULTS:

| Hypertension Severity Grade (0=no HTN, 3=very severe HTN) | Caucasian Proportion | Chinese Proportion | Odds Ratio, Non-Chinese/Chinese |
|---|---|---|---|
| 0 | 0.3590 | 0.4857 | 0.5929 |
| 1 | 0.2906 | 0.3429 | 0.7851 |
| 2 | 0.2564 | 0.1143 | **2.6724** |
| 3 | 0.0940 | 0.0571 | 1.7123 |

**Table 1: Distribution of Hypertension Severity and Odds Ratio**

*The values in **bold** indicate odds ratio values that are significant when comparing Non-Chinese over Chinese likelihood.*

# RESULTS:

| | Overweight, SVD | Overweight, LVD | Hyperlipidemia, SVD | Hyperlipidemia, LVD | Hypertension, SVD | Hypertension, LVD |
|---|---|---|---|---|---|---|
| Chinese | 26.9% | 7.7% | 36.5% | 15.0% | 53.8% | 25.0% |
| OR, SVD/LVD | **4.42** | | **3.26** | | **3.50** | |
| Non-Chinese | 16.5% | 7.9% | 23.6% | 15.0% | 33.1% | 26.0% |
| OR, SVD/LVD | 2.32 | | 1.76 | | 1.41 | |

***Table 2: – Stroke type and Risk Factor***

*The values in **bold** indicate significant proportions and odds ratio values which are different between the two categories: having SVD v.s. having LVD.*

# CONCLUSIONS (1):

- Our study show-cased data suggesting that Chinese-Canadians with stroke more frequently have diabetes than Non-Chinese-Canadians
- Diabetic Chinese-Canadians seem to be especially susceptible to small vessel disease and are uniquely responsive to stroke risk factors compared to the Non-Chinese-Canadians

# CONCLUSIONS (2):

- Chinese-Canadian diabetic stroke patients also seem to have poorer prognosis despite Non-Chinese-Canadians more likely scoring high hypertension severity grades

# CONCLUSIONS (3):

- These results signify that risk factor prevalence and stroke types differ considerably between Chinese-Canadians and Non-Chinese-Canadians within Toronto.

# WHY STROKE EPIDEMIOLOGY DIFFERS BETWEEN CHINESE-CANADIANS AND CAUSASIANS ?

# Patterns of Cerebrovascular Disease of Chinese in Toronto, New York City and China

| City<br>Author | Toronto<br>Chu | New York<br>Foo | China<br>Zhang |
|---|---|---|---|
| Reference | CJNS 30, S(2),S34, 05-2003 | ISC- San Antonio, 02-2002 | Stroke, 2003;34: 09-2003 |
| %ICH | 29.6 | 19.2 | 27.5 |
| % HBP | 63.5 | 75.6 | TAIWAN : LACUNAE= 85.0 |

# Stroke Risk Factors of Chinese in Toronto, New York City and Taiwan

| City<br>Author | Toronto<br>Chu | NYC<br>Foo | Taipei<br>Jeng |
|---|---|---|---|
| % D.M. | 22.9<br>(35% in 2018) | 33.0 | 32.5 |
| % Smoker | 21.6 | 11.8 | 35.0 |
| % Carotid Stenosis* | 6.4 | 11.9 | 10.9 |
| Age of onset | 71.6 | 71.5 | ICH:58.2<br>CI: 65.5 |

# Pathophysiological Mechanisms of Specific Stroke Patterns Among Chinese

- 1.Genetics—Moya Moya Disease, CADASIL
- 2.Dietary factors—
- (i) High salt intake->HBP->Inc. atherosclerosis

(ii) Lower meat intake->?Lower Cholesterol->Less Carotid Disease

(iii) Higher frequency of HBP + DM+ Smoking -> Intracranial Disease = Occlusive +/- small vessel disease

# FUTURE COLLABORATIVE RESEARCH BETWEEN CANADA AND CHINA IS URGENTLY REQUIRED ?

- In order to answer this important question, we need to have prospective, population-based stroke data banks in Canada and China in order to coordinate collaborative research on the interactions between genetics and environmental factors influencing the development of specific stroke patterns of successive generations of Chinese living in Canada !
- Twin studies ?

# ACKNOWLEDGEMENTS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- DIVISION OF NEUROLOGY, DEPARTMENT OF MEDICINE, UNIVERSITY OF TORONTO, CANADA


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(4) Zhang etal **Stroke, 2003; 34:09-2003.**

**(5) Chu JY** 12th Conference on Health Problems related to Chinese in North America – "Stroke among Chinese", San Francisco, October 15 th, 2004.

# THANK YOU !