Ethnic and neighbourhood socioeconomic differences in the incidence and survival from Out-Of-Hospital Cardiac Arrest in Singapore

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INTRODUCTION

- There are documented differences in the incidence and outcome of out-of-hospital cardiac arrest (OHCA) and other cardiovascular diseases among ethnic groups and socioeconomic groups around the globe.
- Singapore-specific data will allow better targeting of education or healthcare outreach activities.

AIMS

- Evaluate associations of ethnicity and neighbourhood socioeconomic deprivation index (SEDI) with age-adjusted incidence and 30-day survival after OHCA.

MATERIALS AND METHODS

- Retrospective, secondary analysis on registry data capturing OHCA cases presenting to emergency medical service (EMS) system or tertiary hospital emergency departments.
- SEDI score obtained for each census planning area.
- Primary outcome: 30-day mortality following OHCA.
- Univariate and forward selection logistic regression used to identify factors associated with Utstein style 30-day mortality (cardiac OHCA cases with initial rhythm of ventricular fibrillation witnessed by a bystander), including ethnicity and SEDI group.

RESULTS

- April 2010 – December 2015, n = 8900

Baseline characteristics	Chinese n=6453 (72.5%)	Malays n=1472 (16.5%)	Indians n=975 (11%)	p-value
Age (years)				
Mean (SD)	68.7 (16.8)	59.6 (18.3)	61.4 (17.9)	<0.001
Median (IQR)	71.0 (59, 81)	61.0 (51, 72)	63.0 (52, 75)	<0.001
Male (%)	4066 (63.0)	953 (64.7)	657 (67.4)	0.021
Comorbidities (%)				
None	640 (9.9)	193 (13.1)	125 (12.8)	<0.001
Heart disease ^a	2319 (38.2)	589 (42.0)	392 (43.9)	<0.001
Diabetes ^a	1965 (32.3)	585 (41.8)	427 (47.8)	<0.001
Hypertension ^a	3637 (59.9)	781 (55.7)	494 (55.3)	0.002
Hyperlipidemia ^a	2364 (38.9)	550 (39.3)	384 (43.0)	0.065
Bystander witnessed arrest (%)	3292 (51.0)	764 (51.9)	510 (52.30)	0.300
Shockable rhythm	1106 (17.1)	251 (17.1)	167 (17.1)	0.555
Location at home	4864 (75.4)	1141 (77.5)	711 (72.9)	0.034
Cause of arrest (%)				<0.001
Presumed cardiac etiology	4375 (67.8)	1084 (73.6)	760 (77.9)	
Non-cardiac etiology	1954 (30.3)	373 (25.3)	192 (19.7)	
Trauma	124 (1.9)	15 (1.0)	23 (2.4)	
Bystander CPR present (%)	2631 (40.8)	601 (40.8)	385 (39.5)	0.739
EMS response time (min)				
Mean (SD)	9.30 (4.02)	9.38 (4.05)	9.37 (3.82)	0.677
Median (IQR)	8.63 (6.63, 11.2)	8.62 (6.63, 11.4)	8.63 (6.70, 11.2)	0.857

^aChinese, n=6075; Malay, n=1401; Indian, n=893

Outcomes	Chinese (n=6453)	Malays (n=1472)	Indians (n=975)	p-value
Primary outcome				
Survival to discharge or 30-days post arrest (%)	250 (3.9)	50 (3.4)	49 (5.0)	0.118
Secondary outcomes				
Any ROSC (%)	2176 (33.7)	480 (32.6)	302 (31.0)	0.203
Survival to admission (%)	1136 (17.6)	253 (17.2)	189 (19.4)	0.333
Post arrest CPC 1/2 (%)	140 (2.2)	27 (1.8)	35 (3.6)	0.050
Utstein survival ^b	102 (14.6)	12 (8.1)	22 (20.4)	0.018

^bChinese, n=699; Malay, n=149; Indian, n=108

Variables	Odds Ratio (95% CI)	
	Forward selection	p-value
Ethnicity		0.072
Indian vs Chinese	0.719 (0.414-1.25)	0.241
Malay vs Chinese	1.79 (0.946-3.40)	0.073
Malay vs Indian	2.50 (1.14-5.46)	0.022
Comorbidities		
Present vs None	1.81 (1.17-2.79)	0.008
Location at home, Y/N	1.57 (1.06-2.32)	0.024
Bystander CPR present, Y/N	0.589 (0.392-0.884)	0.011
EMS response time	1.002 (1.001-1.003)	<0.001

In univariate logistic regression on the Utstein subgroup, ethnicity was statistically significant (p=0.020). In multivariate logistic regression analysis, ethnicity approached statistical significance (p=0.072); Malay vs Indian OR (95% CI) was 2.50 (1.14-5.46). The strongest predictors of 30-day mortality were presence of comorbidity, arrest location at home, bystander CPR, and EMS response time.

- The overall age-adjusted incidence ratios (95% CI) for Malay/Chinese and Indian/Chinese were **1.93 (1.83-2.04)** and **1.95 (1.83-2.08)**.
- The overall age-adjusted incidence ratios (95% CI) for average/low and high/low SEDI group were **1.12 (0.95-1.33)** and **1.29 (1.08-1.53)**.

DISCUSSION AND CONCLUSION

- We found the Malay community to be at higher risk of cardiac arrest and subsequent mortality than the Chinese and Indian communities, which was not explained by neighbourhood socioeconomic disadvantage level.
- There might be opportunity to investigate ethnic and cultural risk factors amenable for interventions in our community.