1 **Onset, Time to Recurrence, and Recurrence Risk Factors of Myocardial Infarction and**
2 **Ischemic Stroke: 10-Year Nationwide one-Million Population Database**

3
4 Kang Jae Jung M.D¹, Hyun Sun Lim Ph.D², and Hyoungh Seop Kim M.D³.

5
6 ¹ Department of Physical Medicine and Rehabilitation, Eulji University Hospital and Eulji
7 University School of Medicine, 95, Dunsanseo-ro, Seo-gu, Daejeon, Korea

8
9 ²Department of Policy Research Affairs, National Health Insurance Service Ilsan Hospital,
10 100 ilsan-ro, Ilsan-donggu, Goyang City, Gyeonggi Do 10444, Korea

11
12 ³Department of Physical Medicine and Rehabilitation, National Health Insurance Service
13 Ilsan Hospital, 100 ilsan-ro, Ilsan-donggu, Goyang City, Gyeonggi Do 10444, Korea

14
15 Corresponding author: Hyoungh Seop Kim M.D

16
17 Department of Physical medicine and Rehabilitation, National Health Insurance Service Ilsan
18 Hospital, 100 ilsan-ro, Ilsan-donggu, Goyang City, Gyeonggi Do 10444, Korea. Tel +82-31-
19 300-0137, Fax +82-31-900-0343, E-mail : rehappdoc@gmail.com

20 Cover title : Attack Time Differences between MI and Ischemic Stroke

21 Tables: 5

22 Figures: 2

23 Word count : 3949

24
25 **Abstract**

Background and Purpose: We aimed to determine the differences in the pathophysiology of myocardial infarction (MI) and ischemic stroke (IS) and present their basic epidemiologic data for public health policy.

Methods: We included patients with a history of admission with diagnostic codes of MI and IS in the National Health Information Database (NHID) of the National Health Insurance Service (NHIS) Sample Cohort 2002-2013. We investigated the time to primary and secondary events, difference in incidence based on sex, time interval for the secondary event following the primary event in MI and IS, and the relative risk of recurrent events compared with that of primary events.

Results: The mean age of onset of IS was significantly higher than that of MI (65.67 ± 12.25 vs. 60.4 ± 13.07 years; $P < 0.05$). The mean period from primary IS to secondary IS was significantly shorter than that from primary IS to secondary MI (2.09 ± 2.80 vs. 5.35 ± 2.90 years; $P = 0.016$). The mean period from primary MI to secondary MI was significantly shorter than that from primary MI to secondary IS (2.30 ± 2.75 vs. 5.16 ± 3.26 years; $P < 0.001$). The incidence of IS in men was significantly higher than that in women. The relative risk of recurrent IS and MI was greater than that of the primary event. In patients younger than 70 years, the incidence of MI was higher than that of IS, while in those above 70 years it was lower ($P < 0.05$).

Conclusions: The age at onset, time to recurrence, sex, and relative risks are significantly different between ischemic stroke and myocardial infarction, suggesting that the underlying pathophysiologic mechanisms might be different between the two.

50 **Introduction**

51

52 Despite the dramatic decline in the mortality of stroke and myocardial infarction (MI) owing
53 to sustained therapeutic advances over the past several decades, MI and stroke have been the
54 first and third most common cause of mortality in the western countries to date, respectively,¹
55 and stroke is a more important cause of mortality and long-term disability.^{2, 3}

56 It is generally accepted that atherosclerosis is a major cause of MI and ischemic stroke
57 (IS).⁴ However, MI is mainly caused by the occlusion of a large coronary artery, whereas IS
58 can occur owing to the occlusion of cerebral arteries due to atherosclerosis or embolus but
59 shows many heterogeneous features.^{5, 6} Despite continuous improvements in therapeutic
60 methods, MI and IS recurrence rates within 5 years have been reported at 21–33% and 25–
61 37%, respectively.^{7, 8} Furthermore, the primary event acts as a risk factor and affects mutual
62 recurrence.⁹

63 Therefore, for preventing primary and secondary overall cardio-cerebrovascular disease, it
64 is necessary to investigate the epidemiologic features of, both, IS and MI and the factors
65 associated with recurrence.

66 However, to date, there have been some reports of epidemiology, treatment, and prevention
67 of either IS or MI, but few comprehensive studies on both diseases in a single cohort have
68 been reported.

69 In this study, we included the patients with a history of admission with diagnostic codes of
70 MI and IS in a 2.2% random sample cohort of the total Korean population from 2002 to 2013
71 (the National Health Information Database (NHID) of the National Health Insurance Service
72 (NHIS) Sample Cohort; NHID-NHIS 2002-2013). We aimed to investigate the basic
73 epidemiologic data for public health and clarify the differences in the pathophysiology of MI
74 and IS.

75 **Methods**

76

77 **Statement of Ethics**

78 This study was reviewed and approved by the Institutional Review Board of our hospital
79 adhered to the tenets of the Declaration of Helsinki. Informed consent was waived. All
80 authors contributed to the study design, interpretation of the results, and made the decision to
81 submit the manuscript for publication. No commercial support for this study was obtained.

82

83 **Database**

84 This retrospective study used NHID-NHIS 2002-2013, which was released by the Korean
85 National Health Insurance Service in 2015. The data comprises of 1,025,340 nationally
86 representative random subjects, amounting to approximately 2.2% of the entire population
87 (46,605,443) in 2002. To distinguish the patients from those with previous illnesses, we
88 excluded 14,520 patients with MI and IS in 2002 and the remaining patients were followed
89 up from January 2002 to December 2013 (Figure 1).

90 The data were generated by the NHIS using a systematic sampling method to generate a
91 representative sample of all Korean residents. This database includes all medical claims filed
92 from January 2002 to December 2013 (Figure 1). We extracted the subjects with cerebral
93 infarction (I63) and myocardial infarction (I20-1) using the International Classification of
94 Disease (ICD-10) in NHIS-NSC 2002-2013. Each primary group of MI and IS comprised
95 subjects who were admitted to the hospitals due to the primary events of ischemic stroke and
96 myocardial infarction, respectively, and then the subgroups were divided on the basis of the
97 successive secondary event. Additionally, the subjects were classified into four subgroups:
98 MIMI (secondary MI after primary MI), MIIS (secondary IS after primary MI), ISMI
99 (secondary MI after primary IS), and ISIS (secondary IS after primary IS).

Statistical analysis

Statistical analysis was performed using SAS system for Windows, version 9.4 (SAS Inc., Cary, NC, USA). Statistical significance was set at 0.05 or less. Independent t-test was performed to verify the differences between MI and IS according to the mean age of onset, the time interval between primary and secondary event, and sex. A chi-square test was used to inspect the relationship between 5-year interval and a primary event in the two groups (MI vs. IS). Age-adjusted incidence rates were calculated and expressed in terms of per 100,000 person-years by the direct method using the standard population derived from the population of Korea in each year. The incidence rate of the difference between IS and MI was investigated using logistic regression analysis.

To compare the incidence of secondary events according to the primary events, we classified and compared the ISIS and ISMI groups with the MIIS and MIMI groups, respectively, by estimating the relative risk of incidence (RR) with 95% confidence intervals (CI).

To identify the effect of a primary event on the recurrence, we also obtained RR of the incidence of secondary events to that of the primary events without a secondary event after 2003.

Results

The mean age of occurrence of IS was significantly higher than that of MI (65.67 ± 12.25 vs. 60.46 ± 13.07 years, mean $\pm$ SD, $P < 0.01$).

The mean period of ISIS was significantly shorter than that of ISMI (2.09 ± 2.80 vs. 5.35 ± 2.90 years, $P = 0.016$). The mean period of MIMI was significantly shorter than that of ISIS (2.30 ± 2.75 vs. 5.16 ± 3.26 years, $P < 0.001$). However, there was no significant difference

between the mean period of MIIS and ISMI groups.

There was no significant difference in the incidence of IS between men and women but the incidence of MI was significantly higher in men than in women (Table 1).

The incidence of ISIS was higher than that of ISMI (RR, 4.45; CI, 3.64-5.45) and the incidence of MIMI was higher than that of MIIS (RR 5.01; CI, 4.18-6.03) (Table 2).

The risk of recurrent IS in patients with a previous primary cardio-cerebrovascular event in 2003 was higher than that in patients with primary IS after 2004 (RR 14.56; CI 13.51-15.69). In addition, the risk of recurrent MI in patients with a previous primary cardio-cerebrovascular event in 2003 was higher than that in patients with primary MI after 2004 (RR 15.50; CI, 14.52-16.55) (Table 3).

A significant statistical difference was found between the incidences of, both, primary IS and MI with age ($P < 0.001$). On logistic regression analysis, the interaction effect between age and the disease (IS and MI) was significant ($P < 0.001$) and the incidence of MI was higher than that of IS in patients younger than 70 years while the incidence of IS was higher than that of MI in patients aged above 70 years (Table 4) (Figure 2).

Discussion

The mean onset age of stroke and MI varies according to region and race, with that of stroke ranging from 64.1 to 71.5 years and MI ranging from 64.1 to 70.5 years.¹⁰⁻¹⁹

According to another Korea Stroke Registry from 2002 to 2010 ($n=46,098$), the mean onset age of stroke was 66.1 ± 12.3 years and this is similar to the results of this study.¹⁸

In a single cohort study of 1,660 patients with IS and MI in the Dijon Vascular project, the mean onset age of IS was 7 years higher than that of MI (71.5 ± 13.1 vs. 64.9 ± 14.7) in men, but was similar in women.¹⁰ In our study, the mean onset age of IS was approximately 5 years higher than that of MI (65.67 ± 12.25 vs. 60.46 ± 13.07). The reason for this observation

is unclear. However, it is believed that the pathophysiologic mechanisms of MI and IS are different. First, the major cause of MI is atherosclerotic changes in large vessels. If there is partial atherosclerotic occlusion of coronary arteries, MI can develop when there is an abrupt increase in the myocardial oxygen demand without total occlusion. IS can be also affected by the atherosclerotic changes in large vessels; however, if a total occlusion due to rupture of an atheromatous plaque does not occur, blood flow may be maintained and symptoms may not occur. IS in small vessels that supply subcortical areas, unlike in large vessels, can develop due to atheriolosclerotic pattern of necrosis or apoptosis of smooth muscle cells.¹⁹ Furthermore, there are many cases of asymptomatic IS in the subcortical areas of the brain. Second, in contrast to a coronary artery in MI, when a large cerebral artery gets occluded gradually, the development of multiple collateral vessels can maintain the cerebral circulation and it is considered to contribute to the delay in the onset of symptoms.²⁰ Third, is already known, IS and MI have similar risk factors. However, hypercholesterolemia is more strongly associated with MI than with IS but hypertension is more strongly associated with IS than with MI. IS requires more time for the development of vessel damage and is considered to occur later in onset.²¹ Fourth, atrial fibrillation and the resulting embolic infarction also increases with age, which may be the reason for increasing IS with age.²² Finally, atrial fibrillation may occur after acute MI due to cardiac structural or electrical changes, which can result in secondary embolic infarction as well.²³

According to another Korea Stroke Registry from 2002 to 2010 (n=46,098), the mean onset age of stroke was 66.1±12.3 years and this is similar to the results of this study.¹⁸

The incidences of IS and MI are generally known to be higher in men than in women.^{18, 24-26} In the OXVASC study,²⁰ the incidences of stroke and MI in men through all ages were similar and the incidence of stroke was higher than that of MI in women aged above 75 years. In our study, the incidence of MI was higher in men than in women. Women have been reported to

have a relatively lower blood pressure compared to men due to the influence of female sex hormones on the pressure-natriuresis relationship.²⁷ However, blood pressure is more influenced by age rather than sex; therefore, gender (behavioral) factors are considered to be more important than sex (biologic) factors.²⁷ In other words, although there are regional differences, in men it appears that there are more risk factors such as smoking, obesity, hypertension, and poor treatment participation for dyslipidemia.^{26, 28}

Regarding the recurrence after a primary event, the relative risk of ISIS was higher than that of ISMI, and that of MIMI was higher than that of MIIS. In addition, the time interval from the primary event to the secondary event, was shorter in ISIS than ISMI, and that in MIMI was shorter than that in MIIS. A previous study reported that 62% of patients with primary IS showed coronary artery stenosis.⁹ In other words, if there is arteriosclerosis of either a cerebral or coronary artery, there is a possibility that occlusion is already ongoing in other vessels and a secondary event is likely to be not only the recurrence of the original event itself (MI or IS) but also of another primary event. In previous studies, both MI and IS were found to have a high recurrence rate within 1 year, especially within 1 month. The development of a primary event after a different primary event (MIIS or ISMI) can be influenced by other factors such as systemic inflammation.^{29, 30} Although both diseases have similar risk factors, it is presumed that they may have different patterns of luminal stenosis of a vessel due to arteriosclerosis and the collateral circulation accompanying it. Therefore, we can infer the reason that there is a high recurrence rate and a short recurrence period for the same secondary event as the primary event.

In a comprehensive analysis, the primary cardio-cerebrovascular event, including IS and MI, was associated with a higher incidence of secondary event than that of primary event.

Based on these results, to prevent a secondary event, there is need for overall consideration of the differences between MI and IS such as different developmental processes according to

age, sex, and major risk factors. Furthermore, it is also believed that IS has a more heterogeneous pathogenic process such as cardiac embolism due to atrial fibrillation or a vascular malformation.

In our study, the age standardized incidence rate was higher in MI than in IS (116/100 000 in IS vs. 137/100,000 in MI). In most western countries, the incidence of MI was higher than that of IS.^{31, 32} Our study showed similar results as previous studies. Furthermore, it also showed that the incidence increased steeply with age and was highest in the 76–80-year age group for IS and 71–75-year age group for MI. The relative incidence of IS was significantly higher than that of MI in patients aged over 70 years but that of MI was higher than that of IS in those aged under 70 years. Similar to our study, the DIVA study showed that the incidence of MI was higher than that of stroke in patients aged less than 65 years but that of stroke was higher than that of MI in those aged over 65 years.¹⁰

Study limitation

In the present study, IS and MI were classified on the basis of the diagnostic code registered in accordance with the KCD codes and the admission history rather than by the universal critical diagnostic criteria. We analyzed the data of a huge sample retrospectively; therefore, it is difficult to clarify causality besides the phenomenological characteristics, i.e., in case of ischemic stroke, the causes of stroke cannot be differentiated between cardiogenic embolic infarction, ischemic stroke after subarachnoid hemorrhage, and a congenital vascular anomaly such as Moyamoya disease. Underlying conditions such as family history, smoking, alcohol consumption, comorbidities, and medication history were not defined in this study. In addition, our study did not reflect the effect of prophylactic procedures or medications such as coronary vessel stent, carotid artery stent, and anticoagulation or antiplatelet medications

223 after the primary events.

224

225 **Summary**

226 The onset age, recurrence interval, sex, and relative risk are significantly different between IS

227 and MI. There could be different pathophysiologic mechanisms between the two diseases.

228 Therefore, the primary and secondary preventive strategies for both the diseases should be

229 prepared individually by age, sex and the primary event.

230

231 Reference

- 232 1. Thiene G, Basso C. Myocardial infarction: A paradigm of success in modern medicine.
233 Cardiovasc Pathol. 2010;19:1-5
- 234 2. Feigin VL, Barker-Collo S, Krishnamurthi R, Theadom A, Starkey N. Epidemiology of
235 ischaemic stroke and traumatic brain injury. Best Pract Res Clin Anaesthesiol. 2010;24:485-
236 494
- 237 3. Kunz A, Dirnagl U, Mergenthaler P. Acute pathophysiological processes after ischaemic and
238 traumatic brain injury. Best Pract Res Clin Anaesthesiol. 2010;24:495-509
- 239 4. Stone JR. Pathology of myocardial infarction, coronary artery disease, plaque disruption, and
240 the vulnerable atherosclerotic plaque. Diagnostic Histopathol. 2012;18:478-483
- 241 5. Uchiyama S. The concept of acute cerebrovascular syndrome. Front Neurol Neurosci.
242 2014;33:11-18
- 243 6. Fisher M, Folland E. Acute ischemic coronary artery disease and ischemic stroke: Similarities
244 and differences. Am J Ther. 2008;15:137-149
- 245 7. Brown TM, Deng L, Becker DJ, Bittner V, Levitan EB, Rosenson RS, et al. Trends in mortality
246 and recurrent coronary heart disease events after an acute myocardial infarction among
247 medicare beneficiaries, 2001-2009. Am Heart J. 2015;170:249-255
- 248 8. Prencipe M, Culasso F, Rasura M, Anzini A, Beccia M, Cao M, et al. Long-term prognosis
249 after a minor stroke: 10-year mortality and major stroke recurrence rates in a hospital-based
250 cohort. Stroke. 1998;29:126-132
- 251 9. Di Pasquale G, Urbinati S, Perugini E, Gambetti S. Interactions between cardiovascular and
252 cerebrovascular disease. Curr Treat Options Neurol. 2012;14:557-593
- 253 10. Gentil A, Bejot Y, Lorgis L, Durier J, Zeller M, Osseby GV, et al. Comparative epidemiology of
254 stroke and acute myocardial infarction: The dijon vascular project (diva). J Neurol Neurosurg
255 Psychiatry. 2009;80:1006-1011
- 256 11. Fukiyama K, Kimura Y, Wakugami K, Muratani H. Incidence and long-term prognosis of initial
257 stroke and acute myocardial infarction in okinawa, japan. Hypertens Res. 2000;23:127-135
- 258 12. Saber H, Thrift AG, Kapral MK, Shoamanesh A, Amiri A, Farzadfard MT, et al. Incidence,
259 recurrence, and long-term survival of ischemic stroke subtypes: A population-based study in
260 the middle east. Int J Stroke. 2016;1747493016684843
- 261 13. Chen HY, Gore JM, Lapane KL, Yarzebski J, Person SD, Gurwitz JH, et al. A 35-year
262 perspective (1975 to 2009) into the long-term prognosis and hospital management of patients
263 discharged from the hospital after a first acute myocardial infarction. Am J Cardiol.
264 2015;116:24-29
- 265 14. Piironen M, Ukkola O, Huikuri H, Havulinna AS, Koukkunen H, Mustonen J, et al. Trends in
266 long-term prognosis after acute coronary syndrome. Eur J Prev Cardiol. 2017;24:274-280.
- 267 15. Lee BI, Nam HS, Heo JH, Kim DI. Yonsei stroke registry. Analysis of 1,000 patients with

268 acute cerebral infarctions. *Cerebrovasc Dis.* 2001;12:145-151

269 16. Gerber Y, Weston SA, Jiang R, Roger VL. The changing epidemiology of myocardial
270 infarction in olmsted county, minnesota, 1995-2012. *Am J Med.* 2015;128:144-151

271 17. Kook HY, Jeong MH, Oh S, Yoo SH, Kim EJ, Ahn Y, et al. Current trend of acute myocardial
272 infarction in korea (from the korea acute myocardial infarction registry from 2006 to 2013). *Am*
273 *J Med.* 2014;114:1817-1822

274 18. Jung KH, Lee SH, Kim BJ, Yu KH, Hong KS, Lee BC, et al. Secular trends in ischemic stroke
275 characteristics in a rapidly developed country: Results from the korean stroke registry study
276 (secular trends in korean stroke). *Circ Cardiovasc Qual Outcomes.* 2012;5:327-334

277 19. Ohira T, Iso H. Cardiovascular disease epidemiology in asia: An overview. *Circ J.*
278 2013;77:1646-1652

279 20. Rothwell PM, Coull AJ, Silver LE, Fairhead JF, Giles MF, Lovelock CE, et al. Population-
280 based study of event-rate, incidence, case fatality, and mortality for all acute vascular events
281 in all arterial territories (oxford vascular study). *Lancet.* 2005;366:1773-1783

282 21. Lewington S, MacMahon S. Blood pressure, cholesterol, and common causes of death: A
283 review. Prospective studies collaboration. *American journal of hypertension.* 1999;12:96s-98s

284 22. Frost L, Vukelic Andersen L, Godtfredsen J, Mortensen LS. Age and risk of stroke in atrial
285 fibrillation: Evidence for guidelines? *Neuroepidemiol.* 2007;28:109-115

286 23. Batra G, Lindhagen L, Andell P, Erlinge D, James S, Spaak J, et al. Angiotensin-converting
287 enzyme inhibitors and angiotensin ii receptor blockers are associated with improved outcome
288 but do not prevent new-onset atrial fibrillation after acute myocardial infarction. *J AM Heart*
289 *Assoc.* 2017;6. pii: e005165. doi: 10.1161/JAHA.116.005165.

290 24. Kim RB, Kim BG, Kim YM, Seo JW, Lim YS, Kim HS, et al. Trends in the incidence of
291 hospitalized acute myocardial infarction and stroke in korea, 2006-2010. *J Korean Med Sci.*
292 2013;28:16-24.

293 25. Bhatnagar P, Wickramasinghe K, Williams J, Rayner M, Townsend N. The epidemiology of
294 cardiovascular disease in the uk 2014. *Heart.* 2015;101:1182-1189

295 26. Hong KS, Bang OY, Kang DW, Yu KH, Bae HJ, Lee JS, et al. Stroke statistics in korea: Part i.
296 Epidemiology and risk factors: A report from the korean stroke society and clinical research
297 center for stroke. *J Stroke.* 2013;15:2-20

298 27. Pilote L, Dasgupta K, Guru V, Humphries KH, McGrath J, Norris C, et al. A comprehensive
299 view of sex-specific issues related to cardiovascular disease. *CMAJ.* 2007;176:S1-44

300 28. Yu C, An Z, Zhao W, Wang W, Gao C, Liu S, et al. Sex differences in stroke subtypes,
301 severity, risk factors, and outcomes among elderly patients with acute ischemic stroke. *Front*
302 *Aging Nerosci.* 2015;7:174

303 29. Rosamond W, Flegal K, Friday G, Furie K, Go A, Greenlund K, et al. Heart disease and
304 stroke statistics--2007 update: A report from the american heart association statistics
305 committee and stroke statistics subcommittee. *Circulation.* 2007;115:e69-171

- 306 30. Witt BJ, Brown RD, Jr., Jacobsen SJ, Weston SA, Yawn BP, Roger VL. A community-based
307 study of stroke incidence after myocardial infarction. *Ann Intern Med*. 2005;143:785-792
- 308 31. Sytkowski PA, D'Agostino RB, Belanger A, Kannel WB. Sex and time trends in cardiovascular
309 disease incidence and mortality: The framingham heart study, 1950-1989. *Am J Epidemiol*.
310 1996;143:338-350
- 311 32. Truelsen T, Mahonen M, Tolonen H, Asplund K, Bonita R, Vanuzzo D. Trends in stroke and
312 coronary heart disease in the who monica project. *Stroke*. 2003;34:1346-1352

313

314

315

316

317

318

Table 1. The Difference in Primary Events between the Sexes.

		Male	Female	P
Total Population number		508,178	507,310	1,015,488
IS	Subjects (n)	600	578	0.5405
	%	0.06	0.06	
MI	Subjects (n)	781	613	<.0001
	%	0.08	0.06	

χ^2 analysis was performed to compare the sexes

Table 2. The Relative Risk of a Secondary Event after a Primary Event.

	$\frac{Subject(n)}{Population(n)}$	%	Relative Risk	95% CI	P-value
IS-IS	$\frac{441}{2356}$	18.72%	4.4545	3.6381-5.4542	<.0001
IS-MI	$\frac{99}{2356}$	4.20%			
MI-IS	$\frac{118}{2788}$	4.23%	5.0169	4.1775-6.0251	< 0.0001
MI-MI	$\frac{592}{2788}$	21.23%			

Abbreviations: IS-IS; Primary ischemic stroke-secondary ischemic stroke, IS-MI; Primary ischemic stroke-secondary myocardial infarction, MI-IS; Primary myocardial infarction-secondary ischemic stroke, MI-MI; Primary myocardial infarction-secondary ischemic stroke.

Table 3. The Relative Risk of Secondary Events of MI and IS after a Primary Event and the Incidence of a Primary Event.

	$\frac{Subject(n)}{Population(n)}$	%	Relative Risk	95% CI	P-value
Secondary IS after primary cardiovascular Event	$\frac{559}{2572}$	21.73%	14.5600	13.5076-15.6944	<.0001
Primary IS Event (2003-2013)	$\frac{15120}{1012916}$	1.49%			
Secondary MI after primary cardiovascular Event	$\frac{691}{2572}$	26.87%	15.5035	14.5216-16.5518	< 0.0001
Primary MI Event (2003~2013)	$\frac{17553}{1012916}$	1.73%			

338 **Table 4. The Incidences of both Primary cardiovascular events related with a 5-year interval**

Age (years)		<40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80	>81	Total
IS*	N	32	34	61	85	94	188	190	191	162	141	1,178
	%	0.01	0.04	0.08	0.16	0.21	0.43	0.56	0.84	1.13	0.98	0.12
	N/100,000	5.18	36.36	78.96	157.05	211.33	434.60	560.64	838.90	1129.16	976.86	116.00
MI*	N	80	85	123	142	158	239	213	168	100	86	1,394
	%	0.01	0.09	0.16	0.26	0.36	0.55	0.63	0.74	0.70	0.60	0.14
	N/100,000	12.96	90.90	159.21	262.37	355.20	552.50	628.50	737.87	697.01	595.81	137.27
Total Population	Number	617,421	93,514	77,253	54,122	44,481	43,258	33,890	22,768	14,347	14,434	1,015,488
	%	60.80	9.21	7.61	5.33	4.38	4.26	3.34	2.24	1.41	1.42	100.00

349 Abbreviation: N, Number

350 *; P<0.001, A logistic regression analysis were performed..

Fig. 1 Flowchart for the Selection of Subjects

Fig 2. The Comparison between the incidence of Primary MI and IS (N/100,000) by 5-year intervals