



**Fig. 1.** Forest plot comparing risk of non-fatal stroke in women with PCOS compared to controls in the older age group (mean > 45 years) (above) and forest plot comparing risk of non-fatal CHD in women with PCOS compared to controls in the older age group (mean > 45 years) (below).

<http://dx.doi.org/10.1016/j.ijcard.2014.06.079>

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## Direct medical costs of hypertension and associated co-morbidities in South Korea



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### ARTICLE INFO

#### Article history:

Received 30 April 2014

Accepted 29 June 2014

Available online 8 July 2014

#### Keywords:

Hypertension  
Medical expenditure  
Heart failure  
Nephropathy

Hypertension (HTN) is a primary risk factor for cardiovascular disease. The costs following cardiovascular events in hypertensive patients are reportedly substantial [1,2]. The estimated direct and indirect costs of HTN among Americans in 2007 totaled \$66.4 billion, making HTN the second most costly cardiovascular-related disorder [1]. Lloyd et al. estimated that UK patients with failure to achieve blood

pressure targets experience 58,000 unnecessary major cardiovascular events annually, at a cost of £97.2 million [2]. These studies have emphasized the disease burden of uncontrolled HTN, causing considerable increases in medical expenditure and in comorbid disease.

In South Korea, the total prevalence rate of HTN in people aged 30 years and over was 26.9% in 2010 [3]. During the 4-year period from 2005 through 2009, HTN therapy costs increased by 64.3% from \$1.4 billion to \$2.3 billion [4]. Moreover, medical expenditure to treat (primary) HTN and other hypertensive diseases is an estimated 2.5 trillion KRW [4]. Given that the proportion of HTN-associated comorbidities is estimated to be 50% [5] and given that the South Korean population is aging rapidly, the future cost burden of HTN and its comorbid conditions will be profound.

In this study, we calculated the direct medical costs of treating HTN and associated comorbidities in South Korea.

This study analyzed data from the 2009 South Korean Health Insurance Review and Assessment Service-National Patients Sample (HIRA-NPS) data. The HIRA database contains reimbursement records from all medical facilities, including both hospitalized cases and outpatient clinic cases, in South Korea. The 2009 HIRA-NPS contains approximately 700,000 in patients (13% of total in patients) and approximately 400,000 outpatients (1% of total outpatients) extracted

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**Table 1**

Mean (95% CI) state and event medical costs of HTN and associated comorbidities among adults (19–64 years) Unit: Korean Won.

	HTN associated comorbidities							
	Only hypertension (18,369)	HYPERT + CHD (8,267)	HYPERT + STROK (5,611)	HYPERT + HF (1,049)	HYPERT + DM (14,265)	HYPERT + NEPHROPATHY (3,527)	HYPERT + two comorbid. (2,418)	HYPERT + three or more comorbid. (344)
State costs (annual)								
Total medical cost	1,679,753 (1,618,594–1,740,912)	5,124,681 (4,877,750–5,371,612)	6,550,722 (6,211,867–6,889,577)	9,473,711 (8,304,949–10,642,473)	4,719,909 (4,536,546–4,903,272)	9,052,376 (8,513,663–9,591,090)	6,954,488 (6,676,948–7,232,028)	12,848,866 (11,892,181–13,805,552)
Prescription medical cost	338,604 (314,984–362,223)	1,014,424 (938,627–1,090,221)	1,194,950 (1,108,856–1,281,044)	2,076,780 (1,720,074–2,433,485)	1,080,594 (1,013,606–1,147,583)	2,630,446 (2,432,927–2,827,966)	1,567,361 (1,470,972–1,663,750)	3,040,445 (2,755,240–3,325,649)
Medical practice cost	1,017,093 (983,469–1,050,717)	2,762,612 (2,621,161–2,904,063)	4,225,858 (4,008,495–4,443,220)	5,303,475 (4,647,538–5,959,412)	2,739,195 (2,635,381–2,843,009)	5,183,586 (4,874,100–5,493,071)	4,064,387 (3,898,409–4,230,365)	7,529,704 (6,947,574–8,111,833)
Event costs (6-month)								
Total medical cost		3,047,996 (2,761,715–3,334,277)	3,127,410 (2,798,302–3,456,517)	4,364,432 (3,524,057–5,204,806)	2,716,085 (2,430,221–3,001,949)	2,666,399 (2,279,617–3,053,181)		
Prescription medical cost		622,914 (520,969–724,859)	582,751 (496,938–668,565)	987,825 (692,010–1,283,639)	666,700 (555,107–778,293)	615,652 (496,218–735,086)		
Medical practice cost		1,590,029 (1,442,025–1,738,033)	2,014,518 (1,794,799–2,234,236)	2,512,043 (2,012,282–3,011,804)	1,529,831 (1,378,456–1,681,206)	1,598,276 (1,374,821–1,821,731)		

'ONLY HTN' group: Patients with HTN without CHD, STROKE, HF, DIABETES, and Nephropathy; 'HYPERT + CHD' group: Patients with HTN and a diagnosis of coronary heart disease; 'HYPERT + STROKE' group: Patients with HTN and a diagnosis of stroke; 'HYPERT + HF' group: Patients with HTN and a diagnosis of heart failure; 'HYPERT + DIABETES' group: Patients with HTN and a diagnosis of diabetes; 'HYPERT + Nephropathy' group: Patients with HTN and a diagnosis of nephropathy; 'HYPERT + two comorbidities' group: Patients with HTN and two of comorbidities among CHD, STROKE, HF, DIABETES, and NEPHROPATHY; and 'HYPERT + three or more comorbidities' group: Patients with HTN and three or more of comorbidities among CHD, STROKE, HF, DIABETES and NEPHROPATHY.

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