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Review Article

Epidemiology of Dyslipidemia in the Asia Pacific Region

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SUMMARY

Dyslipidemia, including high levels of total cholesterol, low-density lipoprotein cholesterol, and triglyceride, and low levels of high-density lipoprotein cholesterol, is a major risk factor of atherosclerosis that leads to various cardiovascular diseases. This article compares the epidemiology of dyslipidemia among countries of the Asia Pacific region, including Australia, China, Indonesia, Japan, Korea, Malaysia, New Zealand, Singapore, Thailand, and Taiwan, based on public-accessible data from websites. Sources of lipid management guidelines of the countries are also summarized. Before comparing the data from each of the countries, the readers should pay attention to the impact of lipid testing methods, medication use, the year of data acquisition, the age range of the examinees, and the definition of dyslipidemia in each country. Apart from the mentioned factors that may affect the epidemiology data, some of the countries have unique features. For example, substantial ethnic differences existed in Indonesia and Malaysia; whereas the reports from China and Thailand exhibited significant regional variations. However, a common feature is that the levels of serum lipids change with age, and men and women may have quite different levels of serum lipids even of the same age range. Nevertheless, there is a lot of room for improvement in the awareness, treatment, and control rate of dyslipidemia. To reduce the prevalence of dyslipidemia and promote cardiovascular health, the epidemiological surveys of dyslipidemia and implementation of management guidelines according to their own national conditions are encouraged.

1. Introduction

The epidemiology of common diseases has changed dramatically over the last few decades. Many countries in the Asia Pacific region have evolved from the status in which the infectious diseases as the major cause of death to where non-communicable diseases now take precedence.[1,2] Cardiovascular disease (CVD) is emerging as one of the important health issues in the Asia Pacific region and augmented by increasing rates of dyslipidemia, diabetes, obesity, and hypertension resulting from rapid urbanization, dietary changes, high smoking rates, and decreasing physical activity.[3,4] Dyslipidemia represents a major risk factor for atherosclerosis affecting arteries of large and medium size and consequently causing ischemia in the brain, heart, or legs. There is convincing evidence from both randomized trials[5] and large observational studies[6,7] that elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglycerides (TG) and low levels of high-density lipoprotein cholesterol (HDL-C) in the blood are associated with an increased risk of CVD. Therefore, early screening and effective lipid management may substantially reduce the burden of CVD and provide great social value.[8]

According to the World Health Organization (WHO) estimates in 2008, the prevalence of dyslipidemia (defined as blood levels of TC > 5 mmol/L [190 mg/dL]) in the Southeast Asia (30.3%) and the Western Pacific (36.7%) were much lower than that in the Europe (53.7%) and the Americas (47.7%).[9] However, the prevalence of dyslipidemia across Asia Pacific region varies (Table 1). Therefore, it is necessary to carefully examine and compare the epidemiology of dyslipidemia between different countries. In this article, we review and report the epidemiology of dyslipidemia of Japan, Korea, China, Taiwan, Thailand, Malaysia, Indonesia, Singapore, Australia and New Zealand, based on the data available for the public from websites. The data from Taiwan will be used as an example to

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Table 1
The prevalence of dyslipidemia across countries in the Asia Pacific region.

Lipid component	Cut-off value to define "abnormal" levels	Country	Prevalence (Year of survey)	Reference
TC	≥6.22 mmol/L or 240 mg/dL	Taiwan	11.2% (male 11.3%, female 11.1%) (2007)	[12]
		Japan	16.2% (male 11.0%, female 19.9%) (2015)	[17]
		Korea	Male 12.6%, female 14.9% (2010–2012)	[18]
		China	12.2% (2008)	[20]
		Malaysia	44.9% (2006–2012)	[26]
		Singapore	17.4% (2010)	[28]
		Indonesia	9.0%–25% (2011)	[27]
	≥5.5 mmol/L or 210 mg/dL	Australia	32.8% (2011–2012)	[29]
	≥200 mg/dL	Philippines	46.9% (2013)	[22]
	≥5 mmol/L or 190 mg/dL	Indonesia/WHO	35.8% (male 33.1%, female 38.2%) (2008)	[9]
LDL-C	≥4.14 mmol/L or 160 mg/dL	Taiwan	7.8% (male 8.6%, female 7.2%) (2007)	[12]
		Japan	11.1% (male 9.0%, female 12.5%) (2015)	[17]
		Korea	15% (male 14.3%, female 15.8%) (2010)[a]	[a]
		China	17.9% (2008)	[20]
		Singapore	15.2% (22% in Malays, 14.1% in Chinese and 15.1% in Indians) (2010)	[28]
		Indonesia	14%–34% (2011)	[27]
	≥3.5 mmol/L or 135 mg/dL	Australia	NA	[29]
	≥130 mg/dL	Philippines	47.2% (2013)	[22]
	According to ATP III classification; high LDL-C are defined as follows: LDL-C ≥100 mg/dL if having prior CHD or CHD equivalent or having 10-year CHD risk >20%; LDL-C ≥130 mg/dL if having ≥2 risk factors (RF) and/or 10-year CHD risk 10%–20%; and LDL-C ≥160 mg/dL if having 0–1 RF.	Thailand	29.6% (2009)	[23,24]
HDL-C	<1.03 mmol/L or 40 mg/dL for men;	Japan	12.7% (male 12.0%, female 13.2%) (2015)	[17]
	<1.30 mmol/L 50 mg/dL for women	Thailand	47.1% (2009)	[24]
		Australia	NA	[29]
	<1.03 mmol/L or 40 mg/dL	Taiwan	10.1% (male 15.7%, female 5.3%) (2007)	[12]
		Korea	NA	[18]
		China	12.0% (2008)	[20]
		Philippines	71.3% (2013)	[22]
	<0.91 mmol/L or 35 mg/dL	Indonesia	23%–66% (2011)	[27]
TG	≥2.26 mmol/L or 200 mg/dL	Taiwan	15.3% (male 19.5%, female 11.6%) (2007)	[12]
		Japan	18.0% (male 25.1%, female 13.0%) (2015)	[17]
		Korea	NA	[18]
		China	15.1% (2008)	[20]
		Thailand	38.6% (2009)	[24]
	≥2.0 mmol/L or 175 mg/dL	Australia	13.9% (male 19.0%, female 9.0%)	[29]
	≥150 mg/dL	Philippines	38.6% (2013)	[22]

Abbreviation: ATP III=The Third Adult Treatment Panel; CHD = coronary heart disease; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; NA = not available; TC = total cholesterol; TG = triglyceride.

[a] The data were cited from "Prevalence and Management of Dyslipidemia in Korea: Korea National Health and Nutrition Examination Survey during 1998–2010" (Diabetes Metab J 2013; 37:433–449.).

explain the general aspect of dyslipidemia followed by the relevant data from each of the countries at the sequence from north east to south west.

Before examining and comparing the data across different countries, some issues should be clarified: (1) Is the composition of dyslipidemia identical in reports from each of the countries? Generally, "dyslipidemia" indicates that at least one component of serum lipids is abnormal (i.e. high TC, high LDL-C, low HDL-C, and high TG). However, not all studies have investigated and reported the four components. (2) Is the method of measurement the same? For example, the level of blood LDL-C can be directly measured, or obtained using Friedewald formula. The level of LDL-C from the same blood sample may yield different results by the two methods.[10,11] (3) The prescription rate of lipid-lowering drugs differs. (4) The cut-off value of serum lipids to define dyslipidemia is not identical between the countries. (5) The year of investigation, and the distribution of age in the surveys were different between studies (Table 1).

2. Taiwan

According to the TW3H (i.e. hypertension, hyperglycemia, and hyperlipidemia in Taiwan) survey in 2002, among the people aged <50 years the blood levels of TC, LDL-C and TG increased with age, and were higher in men than that in women. This gender gap became reduced with age. After 50 years of age, the blood levels of TC, LDL-C, and TG in women were gradually higher than those in men. Additionally, the blood level of HDL-C was higher in women than that in men among all age groups.[12] This trend in age and gender was generally seen in the Asia Pacific countries.

The follow-up report of TW3H in 2007 showed that the situation of dyslipidemia was similar to that in 2002. The prevalence of high TC (TC = 240 mg/dL), high LDL-C (LDL-C ≥160 mg/dL), low HDL-C (HDL-C <40 mg/dL), and high TG (TG = 200 mg/dL) were 11.2% (11.3% for men, 11.1% for women), 7.8% (8.6% for men, 7.2% for women), 10.1% (15.7% for men, 5.3% for women), and 15.3% (19.5% for men, 11.6% for women), respectively.

The control rate of dyslipidemia in high-risk patients remained to be improved. In T-SPARCLE (Taiwanese Secondary Prevention for patients with AtheRosCLErotic disease) study, only 54% of patients with stable coronary artery disease (CAD) and cerebrovascular disease achieved the level of LDL-C <100 mg/dL.[13] The prescription rate of lipid-lowering drugs was also inadequate in high-risk patients, with only 60% of patients with acute coronary syndromes (ACS) and 38% of patients with ischemic stroke using lipid-lowering drugs.[14,15] Recently, the 2017 Taiwan lipid guidelines for high-risk

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