Metabolic Syndrome in South Korea: Does It Add Value from an Underwriting and Pricing Perspective?

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This article summarizes current knowledge about the metabolic syndrome (MetSyn) and addresses the question, "Does the MetSyn add new information that is important from an underwriting and pricing perspective?"

History

The association of several disorders that increase the risk of cardiovascular disease has been known for over 80 years. However, the modern concept of the MetSyn started in 1988 when Gerald Reaven first described a cluster of risk factors that increased the risk of both cardiovascular disease and type 2 diabetes mellitus.(1) Since then this disorder has been called the insulin resistance syndrome, the deadly quartet, and syndrome X, before reaching its current name of MetSyn.

Definition

In an effort to introduce the MetSyn into clinical practice, several organizations attempted to create simple criteria for its diagnosis, starting in 1998 with the World Health Organization (WHO) definition.(2) Other definitions followed (Table 1) because of disagreement about which risk factors should be included and the appropriate cutpoints to define higher risk. For example, two measures of insulin resistance that appeared in earlier definitions – a glucose tolerance test and measurement of insulin levels – were eliminated because they were not practical for general medical practice.

Table 1. Earlier definitions of the metabolic syndrome

Date	Organization
1998	World Health Organization
1999	European Group for Study of Insulin Resistance
2001	National Cholesterol Education Program Adult Treatment Panel III (ATP–III)
2003	American Association of Clinical Endocrinologists
2005	International Diabetes Federation (IDF)

Figure 1 shows the two most commonly used definitions: the Adult Treatment Panel III (ATP-III) and the International Diabetes Federation (IDF). They are identical for four of the five criteria and their cutpoints (triglyceride elevation, low HDL cholesterol, elevated blood pressure, and elevated fasting blood glucose or prior diagnosis of type 2 diabetes). They differ in how they deal with obesity, which is defined by ethnicity-specific waist circumference. With ATP III, MetSyn can be diagnosed with any three of the five criteria (with or without increased waist circumference); for IDF, increased waist circumference must always be present, plus two of the other four non-obesity criteria.

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Figure 1. Comparison of the two most common classifications of the metabolic syndrome

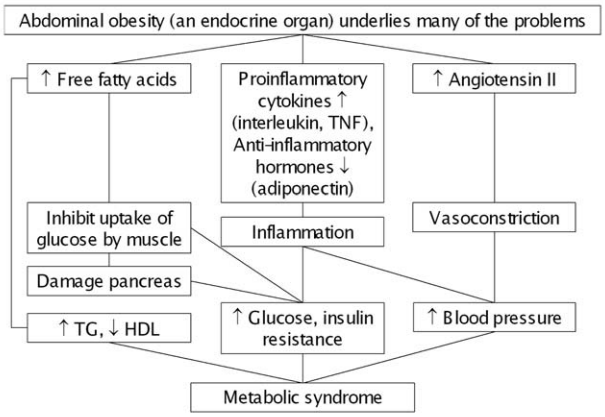
	Adult Treatment Panel III (ATP III)	International Diabetes Federation (IDF)
	Any 3 of the 5 criteria below	Increased waist circumference + any 2 of the 4 non-obesity criteria below
Obesity based on waist circumference (WC)*	United States obesity criteria WC ≥102 cm (40.2 inches) men WC ≥88 cm (34.6 inches) women Asian obesity criteria WC ≥90 cm (35.4 inches) men WC ≥80 cm (31.5 inches) women	Europids, Africans, Middle East WC ≥94 cm (37 inches) men WC ≥80 cm (31.5 inches) women Chinese, Japanese, South Asians, ethnic South & Central Americans WC ≥90 cm (35.4 inches) men WC ≥80 cm (31.5 inches) women
Triglycerides	≥150 mg/dl (1.7 mmol/L) or drug treatment for this lipid abnormality	≥150 mg/dl (1.7 mmol/L) or drug treatment for this lipid abnormality
HDL cholesterol	<40 mg/dl (1.0 mmol/L) men <50 mg/dl (1.3 mmol/L) women, or drug treatment for this lipid abnormality	<40 mg/dl (1.0 mmol/L) men <50 mg/dl (1.3 mmol/L) women, or drug treatment for this lipid abnormality
Blood pressure	Systolic ≥130 or diastolic ≥85, or drug treatment for hypertension	Systolic ≥130 or diastolic ≥85, or drug treatment for hypertension
Fasting blood glucose	≥100 mg/dl (5.6 mmol/L) or prior diagnosis of type 2 diabetes	≥100 mg/dl (5.6 mmol/L) or prior diagnosis of type 2 diabetes
* If body mass index (BMI) is >30 kg/m², central obesity can be assumed and waist circumference does not need to be measured.		

Pathophysiology

MetSyn is caused primarily by obesity (especially abdominal obesity) and/or insulin resistance. Secondary causes include physical inactivity, aging, hormonal imbalance, and genetic or ethnic predisposition.

The pathophysiology is displayed in Figure 2.[3] It shows that intraabdominal adipose tissue is an endocrine organ which is metabolically very active compared to fat deposits in other locations in the body.

Figure 2. Pathophysiology of the metabolic syndrome

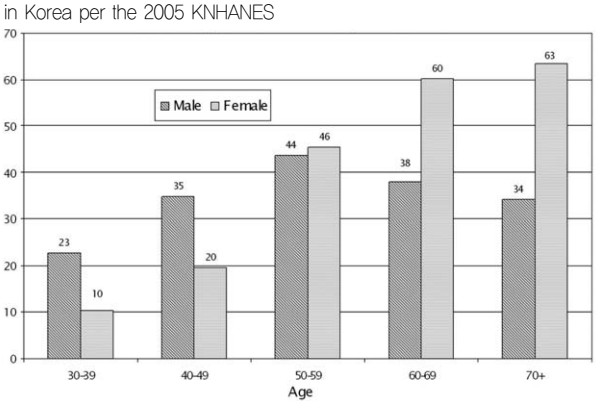


Prevalence

Rapid economic growth in South Korea has resulted in lifestyle changes, especially increased consumption of a high-fat diet and decreased physical activity, that have increased the frequency of cardiovascular risk factors. As expected, this has also led to an increase in the number of people with MetSyn.

Figure 3 shows the age-and sex-specific prevalence of MetSyn in Korea based on the Third Korea National Health and Nutrition Examination Survey (KNHANES III), 2005. The survey used Asian criteria to diagnose obesity (waist circumference greater than 90 cm for males, greater than 80 cm for females).[4]

Figure 3. Age-and sex-specific prevalence of the metabolic syndrome in Korea per the 2005 KNHANES



The prevalence of MetSyn generally increases with age, and is more common in women than in men at ages 50 and older. The percentages in Figure 3 should be considered only estimates. As indicated in Table 2, prevalence varies with the diagnostic criteria.

Table 2. Prevalence (%) of metabolic syndrome in Koreans according to different criteria

Criteria	Male	Female
Asian modified National Cholesterol Education Program[6]	23.4	27.2
Asian modified World Health Organization[6]	19.0	13.6
International Diabetes Federation[5]	16.8	16.1
National Cholesterol Education Program[6]	15.9	17.9
World Health Organization[6]	12.5	8.0

Treatment

Treatment recommendations are summarized in Table 3. The most effective treatment – weight loss, daily exercise, healthy diet, and smoking cessation – is also the most difficult because it requires a change in lifestyle. Medical treatments include control of blood pressure, lipids, diabetes or prediabetes, and daily aspirin to decrease the risk of blood clotting.

Table 3. Recommended treatment for metabolic syndrome

Treatment	Goal
Weight loss	Reduce body weight by 7%–10% in the first year
Exercise	30–60 minutes, 5–7 days/week
Healthy diet	Low cholesterol, low saturated fat
Smoking	Stop smoking
Blood pressure	Reduce to less than 140/90
Lipids	
LDL cholesterol	If moderate cardiovascular risk, reduce to <130 mg/dL (3.4 mmol/L)
	If high CV risk, reduce to <100 mg/dL (2.6 mmol/L)
Triglycerides	Reduce to <200 mg/dL (2.3 mmol/L)
HDL cholesterol	Increase, but no specific goal
Blood glucose	
Diabetic	Reduce hemoglobin A1c to <7%
Prediabetic	Consider metformin (Glucophage), acarbose (Precose), or Orlistat (Xenical)
Aspirin	Daily, to decrease blood clotting

Treatment is often unsuccessful. Some people cannot change their lifestyle. Others are unwilling or unable (because of the cost or side-effects) to take all the recommended medications, which could include as many as two drugs for control of lipids, three for blood pressure, two for glucose control, and daily aspirin.

Why was MetSyn introduced?

The goal of the MetSyn is to provide a simple public health strategy to define higher risk of cardiovascular disease and diabetes,[7] especially by identifying people with multiple minor risk factor abnormalities that are often ignored. However, there are growing concerns that a diagnosis of MetSyn doesn't add any useful information to the risk criteria that are already used by physicians. The principal objections were summarized in a joint statement from the American Diabetes Association and the European Association for the Study of Diabetes (Table 4).[8]

Table 4. Summary of concerns about the metabolic syndrome

Criteria are ambiguous or incomplete: rationale for thresholds is ill-defined
Value of including diabetes in definition is questionable
Insulin resistance as unifying cause is uncertain
No clear basis for including or excluding other cardiovascular risk factors
Cardiovascular risk value is variable and dependent on specific risk factors present
Cardiovascular risk associated with the syndrome seems to be no greater than sum of its parts
Treatment of syndrome is no different from treatment for each of its components
Medical value of diagnosing the syndrome is unclear

Criticism of the MetSyn has increased to the point where a number of highly influential researchers, medical journals, and organizations have suggested that it should no longer be used as a clinical or epidemiologic diagnosis.[9][10] As an example, a June 2008 study in the British journal Lancet concluded that (1) a fasting blood glucose test is as good as or potentially better than a diagnosis of MetSyn for predicting diabetes, (2) a diagnosis of MetSyn has only a negligible association with risk of cardiovascular disease, and (3) a diagnosis of MetSyn had no apparent clinical value.[11]

Even Gerald Reaven, the physician who first described the MetSyn, has expressed doubt about the value of this diagnosis. In an article entitled "Requiescat in Pace" (Rest in peace), he writes:

> "It is not clear that it [numerous studies on the MetSyn] has led to the delivery of any new information of significant utility to the practicing clinician. In fact, ...there is a real possibility that use of the ATP III criteria [to diagnose MetSyn] could do more harm than good."[12]

Figure 5. Detailed comparison of Metsyn and Framinghamrisk factors

Metabolic syndrome risk factors					
Lipids				Blood pressure	
Triglycerides		HDL cholesterol		Systolic ≥130 mm Hg	
>150 mg/dL (1.7 mmol/L)		Men <40 mg/dL (1.0 mmol/L)		Diastolic ≥85 mm Hg	
Treatment for lipids		Women <50 mg/dL (1.3 mmol/L)		Treatment for hypertension	
		Treatment for lipids			
Central obesity		Raised fasting plasma glucose			
Yes / no		Fasting plasma glucose ≥100 mg/dL (5.6 mmol/L) or type 2 DM			
Framingham risk factors (similar to factors used by insurers)					
Lipids				Blood pressure	
Total cholesterol		HDL cholesterol		Systolic	Diastolic
mg/dL	mmol/L	mg/dL	mmol/L	<120	<80
<160	<4.14	<35	<0.90	120–129	80–84
160–199	4.15–5.17	35–44	0.91–1.16	130–139	85–89
200–239	5.18–6.21	45–49	1.17–1.29	140–159	90–99
240–279	6.22–7.24	50–59	1.30–1.55	160+	100+
280+	7.25+	60+	1.56+		

Age	
30–34	55–59
35–39	60–64
40–44	65–69
45–49	70–74
50–54	

Sex	Smoking	Diabetes
Male / female	Yes / no	Yes / no

Underwriting

Insurers already use the traditional (Framingham) cardiovascular risk factors (which include a blood glucose test) during the underwriting process. The question is, “Does the MetSyn add new information that is important from an underwriting and pricing perspective?” The short answer is “No.”

Cardiovascular risk

Figure 4 compares MetSyn and Framingham risk factors for prediction of cardiovascular risk. Both systems include lipids, blood pressure, and elevated blood glucose. MetSyn adds obesity, which is a weak predictor of cardiovascular risk because most of its value is already accounted for by blood pressure, cholesterol, and blood glucose.[13] In contrast, the Framingham system adds age, sex, and smoking status, which are strong predictors (much stronger than obesity) of cardiovascular risk.

Figure 5 gives more detail regarding the relative value of these two systems. Risk factors in the MetSyn are dichotomous (“Normal” or “Abnormal”), while the Framingham system has multiple cutpoints for lipids and blood pressure, plus age, sex, and smoking status.

Figure 4. Framingham risk factors used by insurers are better than MetSyn for predicting cardiovascular risk

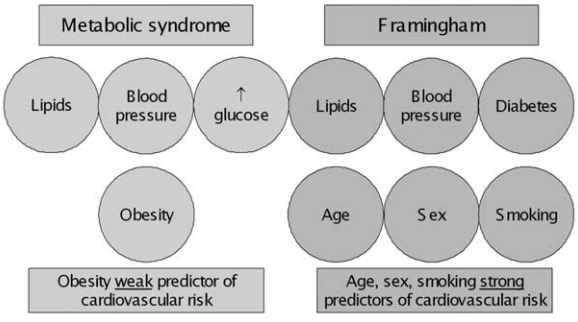
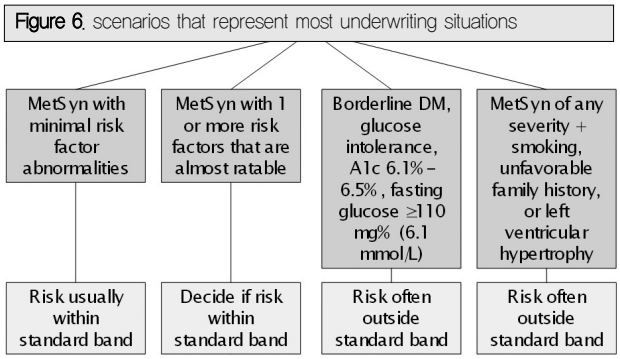


Figure 6. scenarios that represent most underwriting situations



Diabetes risk

The same is true for the risk of type 2 diabetes. As noted earlier, a fasting blood glucose test is as good as or potentially better than a diagnosis of MetSyn for predicting diabetes.(11)

Insurers' underwriting practices

Insurers usually ignore minor abnormalities of MetSyn risk factors. This is done for the following reasons:

- Desire to accept most applications at ordinary rates.
- Competition.
- Small risks are already included in ordinary (standard) rates, e.g., an insurer's standard range might be 100%-135%.
- Lack of data regarding the risk associated with different combinations of slightly abnormal risk factors.

However, insurers' risk selection practices identify factors that are far more predictive (compared to MetSyn) of higher risk, such as age, sex, smoker / nonsmoker status, and significant ("ratable") elevations of body mass index (BMI), blood pressure, cholesterol, and blood glucose.

General underwriting approach

Figure 6 shows four scenarios that represent most underwriting situations regarding MetSyn, plus general comments for how risk might be assessed. (DM refers to diabetes mellitus, and A1c refers to hemoglobin A1c.) Actual decisions would vary from company to company according to their own underwriting guidelines.

Conclusions

1. Medical opinion is beginning to turn against MetSyn. Many reports have compared MetSyn with much simpler risk-assessment tests for cardiovascular disease, and the simpler tests are significantly better. In addition, a simple fasting blood glucose measurement is a better predictor of future diabetes than the expense and inconvenience necessary to diagnose MetSyn.(9)
2. From a risk perspective, MetSyn is consistently outperformed by scoring systems (similar to those used by insurers) that use age, sex, and smoking status, together with personal and family history of cardiovascular disease.(10)
3. Minor abnormalities of MetSyn risk factors are usually included in ordinary (standard) rates.

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