Prevalence of and associations between metabolic syndrome and the constitutions defined by Korean Eight Constitution Medicine

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Abstract
Eight Constitution Medicine (ECM) is a Korean constitutional medicine system that classifies people into 8 types: Pulmotonia (PUL), Colonotonia (COL), Renotonia (REN), Vesicotonia (VES), Pancreotonia (PAN), Gastrotonia (GAS), Hepatonia (HEP), and Cholecystonia (CHO). Metabolic syndrome (MS) is a major public health problem worldwide. We assessed the prevalence of and associations between ECM and MS. Cross-sectional convenience sample of 245 adults was used at a medical check-up center in Seoul, South Korea, from 2010 to 2015. Adults were classified into 1 of 8 constitutions by an ECM specialist. MS was diagnosed on the basis of National Cholesterol Education Program Adult Treatment Panel III and Asian Pacific Criteria for abdominal obesity. We also computed the prevalence by percentage and calculated odds ratios (ORs) for MS among 6 constitutions with PUL as the reference.

Among 245 adults, 20 (8.2%) were diagnosed with PUL, 43 (17.6%) with COL, 35 (14.3%) with REN, 4 (1.6%) with VES, 71 (29.0%) with PAN, 0 (0.0%) with GAS, 54 (22.0%) with HEP, and 18 (7.3%) with CHO. The prevalence of MS in the constitutions was significantly different: CHO, 38.9%; HEP, 35.2%; PAN, 18.3%; COL, 11.6%; PUL, 5.0%; REN, 2.9% (P = .001). We observed higher ORs for HEP and CHO (OR = 13.03, 95% confidence interval [CI] = 6.11–105.70; and OR = 13.19, 95% CI = 1.39–125.46, respectively) than for the other constitutions.

People with HEP and CHO constitutions could be at higher risk for MS. Therefore, ECM-based diagnosis may be useful for preventing and managing MS.

Abbreviations: CHO = Cholecystonia, COL = Colonotonia, DBP = diastolic blood pressure, ECM = Eight Constitution Medicine, FBG = fasting blood glucose, GAS = Gastrotonia, HbA1C = hemoglobin A1C, HDL-C = high-density lipoprotein cholesterol, HEP = hepatonia, MS = metabolic syndrome, OR = odds ratios, PAN = Pancreotonia, PUL = Pulmotonia, REN = Renotonia, SBP = systolic blood pressure, VES = Vesicotonia, WC = waist circumference.

Keywords: constitutional medicine, Eight Constitution Medicine, Korean medicine, metabolic syndrome

1. Introduction
The Eight Constitution Medicine (ECM) typology is a Korean constitutional medical system originally proposed by Dr Do-won C. Lee. The concept of constitution was introduced into human sciences in 4th century AD, and the most famous research was published by Jema Lee, a medical scientist born at the end of the Korean Josun dynasty (1837–1899). It classified individuals into Tae-yang, Tae-yeum, So-yang, and So-yeum constitutions based on the strength and weakness of 4 organs: liver, lung, pancreas, and kidney. Drug treatment can be administered on the basis of these 4 constitutions.

ECM theory classifies humans into 8 types based on their congenital arrangement of organic strengths: Pulmotonia (PUL), Colonotonia (COL), Renotonia (REN), Vesicotonia (VES), Pancreotonia (PAN), Gastrotonia (GAS), Hepatonia (HEP), and Cholecystonia (CHO) (Table 1). For example, people with PUL have the weakest liver function, but the strongest lung function. They tend to have a higher likelihood of atopic dermatitis and their bodies are relatively slender. People with COL have good large intestinal function, but poor gall bladder function. They are also generally slender, but are at high risk of rare illnesses, such as muscle atrophy, if they overeat meat, and tend to have hot tempers. People with REN have the strongest kidney function, but the weakest pancreatic function.
with VES have a weak stomach, but a strong bladder, a small waist, and a balanced upper and lower body.\textsuperscript{[5,6]} People with PAN have good pancreatic and digestion functions, but weak kidney function. Their upper bodies are more developed than their lower bodies.\textsuperscript{[5,6]} People with GAS have the best gastrointestinal function, but the worst bladder function. This constitution is very rare, with an incidence rate of 1/100,000.\textsuperscript{[5,6]} People with HEP have good liver function, but poor lung function. Many people with HEP have a large body size, and sweating is recommended to maintain their health.\textsuperscript{[5,6]} People with CHO have strong gallbladder function, but weak colon function. Similar to those with HEP, they tend to experience frequent bowel movements and have a large physique.

To classify individuals according to the ECM, Dr Kuon proposed 8 pulse patterns of the radial artery.\textsuperscript{[10]} Figure 1 shows that the pulse pattern consists of a combination of pulses from the left and right radial arteries. ECM pulse diagnosis is different from traditional pulse diagnosis, in terms of both the location at which it is performed and the method that is used. A previous study reported that ECM pulse diagnosis is reproducible and repeatable depending on the skill of the examining doctor.\textsuperscript{[18]}

Another study reported that many clinical cases provide accurate and reproducible diagnoses.\textsuperscript{[19]}

Treating the ECM constitutions involves performing constitution-based acupuncture and informing patients about beneficial and harmful foods (Table 2).\textsuperscript{[19]} In Korea, ECM has been widely studied and is used in many traditional Korean medicine clinics. Constitutional medicine is effective in treating various diseases in the clinic.\textsuperscript{[10–14]}

MS is a complex disease that results from interactions among physiological, biochemical, clinical, and metabolic factors; it directly increases the risks of cardiovascular disease, type 2 diabetes, and even death.\textsuperscript{[15,16]} MS is a major public health concern and clinical problem in developing and developed countries.\textsuperscript{[17]} Several studies have identified important risk factors that affect MS, such as BMI, aging, and hormonal imbalance.\textsuperscript{[18–20]} Other studies indicate that low-density lipoprotein cholesterol (LDL-C) and body mass index (BMI) are more strongly associated with CHO and HEP than the other constitutions, suggesting that certain constitutions may be at risk of MS.\textsuperscript{[21]} A useful method for treating MS is lifestyle change therapy, which combines specific diet recommendations, physical activity, and other behaviors.\textsuperscript{[17]} Using ECM to identify congenital factors and to inform lifestyle changes may be an effective strategy for preventing MS.\textsuperscript{[19]} The aim of the present study was to examine the prevalence of MS across different constitutions and to document the relationship between ECM
and MS in individuals who participated in a health screening at our medical institution.

2. Methods

2.1. Design and sample

This cross-sectional study surveyed a convenience sample of 245 individuals from among 329 people who participated in a health examination at 1 medical check-up center in Seoul, South Korea between 2010 and 2015. Eighty individuals were excluded because they were not diagnosed with an ECM constitution. This study was granted approval from the university institutional review board of the medical check-up center (2015-09-143).

2.2. Measures and diagnosis of ECM

Medical staff performed standard operational procedures and obtained basic measures such as history of exercise, smoking, alcohol intake, body weight, height, waist circumference, blood pressure, and any treatment for previous diseases. Venous blood was collected after fasting for >12 hours.

The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines were used to define MS.\(^{[22]}\)
These guidelines require at least 3 of the following 5 criteria for MS: a fasting blood glucose (FBG) ≥100 mg/dL or taking medication for diabetes mellitus,[22] triglycerides (TG) ≥150 mg/dL,[22] high-density lipoprotein cholesterol HDL-C <40 mg/dL for men and 50 mg/dL for women,[22] systolic blood pressure (SBP) ≥130 mmHg and/or diastolic blood pressure (DBP) ≥85 mmHg, or taking medication for high blood pressure,[22] and central obesity with waist circumference (WC) ≥90 cm for men and ≥80 cm for women.[23]

Patients’ constitutions were diagnosed using Dr Kuon’s 8 pulse patterns of the radial artery, as shown in Fig. 1. The diagnoses were made twice to ensure accuracy and reproducibility.

### 2.3. Statistical analysis

All data were cleaned and analyzed in SPSS 24.0 (IBM Corp., Armonk, NY).[24] Data were missing for >20% of the variables from 4 people; therefore, after ensuring that they did not differ significantly on selected variables from those with no data missing, they were excluded, leaving 245 for further analysis. Missing data for the remaining surveys were handled with multiple imputation. Descriptive statistics were computed to characterize the samples. One-way analyses of variance (ANOVA s) were used to compare blood test results across the 8 constitutions, and a chi-squared test was performed to test associations between constitution types and the prevalence of MS. Finally, odds ratios (OR) for MS were calculated with logistic regression analysis adjusted by age and sex. All statistical significances were reported at P < .05, except for the ANOVA results, which used Bonferroni adjustment for comparing blood tests due to a problem with multiple comparisons.

### 3. Results

Table 3 shows the distribution of demographic information and constitutions. Of the 245 patients, 48.2% (n = 118) were women; the average age was 54.85 (standard deviation [SD] = 10.94). Twenty participants (8.2%) were diagnosed with PUL, 43 (17.6%) with COL, 35 (14.3%) with REN, 4 (1.6%) with VES, 54 (22.0%) with HEP, 18 (7.3%) with CHO, and 71 with PAN (29.0%). The distribution of constitutions was consistent with those of previous studies.[25] As previously mentioned, GAS is very rare and only observed in 1/100,000 individuals; there was no case with GAS constitution in the present study.[6,26]

Results of one-way ANOVA s revealed several significant differences in the physical measurements associated with each constitution (see Table 4). BMI was significantly different by constitution (F[6, 238] = 15.16, P < .001). The post hoc comparison using Tukey HSD test indicated that HEP and CHO had significantly higher BMI than did PUL, COL, REN, and VES. PAN had significantly higher BMI than did COL, REN, and VES, but lower BMI than CHO (all P < .05). Waist circumference was also significantly different among the constitution groups (F[6, 238] = 15.91, P < .001). Similarly, the post hoc comparison

### Table 3

**Age and sex in the 8 constitutions.**

|     | PUL (n = 20) | COL (n = 43) | REN (n = 35) | VES (n = 4) | HEP (n = 54) | CHO (n = 18) | PAN (n = 71) | P-value  |
|-----|--------------|--------------|--------------|-------------|--------------|--------------|--------------|----------|
| Age | 56.85 ± 10.37 | 52.07 ± 11.04 | 52.07 ± 10.48 | 51.00 ± 9.90 | 56.33 ± 11.72 | 57.44 ± 12.53 | 55.52 ± 10.09 | .258     |
| Sex | Male         | Female       |Female        |Male         | Female       |Male          |Female       |          |
|     | 10 (50.0)    | 10 (50.0)    | 11 (31.4)    | 12 (27.9)   | 11 (31.4)    | 13 (44.4)    | 13 (31.0)    |          |

VES was excluded from the chi-squared test of association in order to avoid the violation of assumptions due to no observation with MS; CHO = Colonicotonia, COL = Colonotonia, HEP = Hepatonia, PAN = Pancreotonia, PUL = Pulmonotonia, REN = Renotonia, VES = Vesicotonia.

### Table 4

**Blood test results (M±SD) in the 8 constitutions.**

|     | PUL (n = 20) | COL (n = 43) | REN (n = 35) | VES (n = 4) | HEP (n = 54) | CHO (n = 18) | PAN (n = 71) | P-value  |
|-----|--------------|--------------|--------------|-------------|--------------|--------------|--------------|----------|
| FBS | 95.3 ± 17.8  | 92.3 ± 17.8  | 90.6 ± 13.1  | 80.5 ± 10.7  | 97.7 ± 16.9  | 106.4 ± 32.3 | 98.1 ± 17.4  | .023     |
| BMI | 21.2 ± 2.0   | 21.5 ± 2.3   | 21.2 ± 2.1   | 17.8 ± 2.5   | 24.0 ± 2.8   | 25.4 ± 2.2   | 23.0 ± 2.4   | <.001    |
| WC  | 79.2 ± 5.1   | 79.5 ± 8.3   | 78.4 ± 5.8   | 71.1 ± 5.8   | 88.9 ± 8.5   | 89.7 ± 6.5   | 84.1 ± 6.4   | <.001    |
| SBP | 113.5 ± 12.2 | 114.3 ± 13.7 | 110.2 ± 11.0 | 114.3 ± 5.9  | 118.4 ± 12.8 | 123.1 ± 12.7 | 117.2 ± 13.1 | <.001    |
| DBP | 73.4 ± 8.6   | 71.9 ± 9.9   | 68.9 ± 8.1   | 71.5 ± 6.2   | 73.6 ± 9.6   | 78.1 ± 10.8  | 75.2 ± 8.3   | .010     |
| TOH | 205.0 ± 38.3 | 191.3 ± 25.3 | 196.1 ± 33.5 | 188.3 ± 38.9 | 199.1 ± 44.7 | 172.4 ± 24.7 | 196.6 ± 38.0 | .136     |
| TG  | 121.5 ± 63.7 | 96.4 ± 76.4  | 86.3 ± 36.3  | 63.3 ± 7.5   | 115.4 ± 55.4 | 112.4 ± 108.6| 108.7 ± 63.7 | .219     |
| HDL | 54.9 ± 10.1  | 57.7 ± 9.9   | 60.9 ± 11.5  | 66.5 ± 15.6  | 52.4 ± 12.4  | 50.6 ± 11.7  | 56.4 ± 13.1  | .008     |
| LDL | 125.4 ± 33.3 | 113.0 ± 32.7 | 117.9 ± 32.4 | 105.5 ± 27.8 | 122.2 ± 37.7 | 100.6 ± 29.5 | 116.9 ± 32.6 | .201     |
| HbA1C| 5.6 ± 0.6  | 5.5 ± 0.4    | 5.4 ± 0.3    | 5.6 ± 0.2    | 5.6 ± 0.3    | 5.6 ± 0.7    | 5.7 ± 0.7    | .227     |
| MS No | 19 (95.0) | 15 (69.0)    | 4 (100.0)    | 22 (40.7)    | 14 (77.8)    | 49 (35.2)    | 13 (18.3)    | <.001    |

Note: Statistical significance at P < .005 under Bonferroni adjustment is bolded.

BMI = Body mass index, CHO = Cholecystotonia, COL = Colonotonia, DBP = Diastolic blood pressure, FBS = Fasting blood sugar, HbA1C = Hemoglobin A1c, HDL = High-density lipoprotein cholesterol, HEP = Hepatonia, MS = Metabolic syndrome, PAN = Pancreotonia, PUL = Pulmonotonia, REN = Renotonia, SBP = Systolic blood pressure, TOH = Total cholesterol, TG = Triglycerides, VES = Vesicotonia, WC = Waist circumference.

Chi-squared test was run without VES in order to avoid the violation of assumptions.
using Tukey HSD test revealed that HEP and CHO had significantly higher WC than did PUL, COL, REN, and VES. PUL had significantly higher WC than COL, REN, and VES, but lower WC than HEP (all $P < .05$). These results indicate that those with HEP and CHO diagnosis had higher BMI and WC associated with their body type.

Systolic blood pressure (SBP) was significantly different among constitution groups ($F[6,238]=4.29$, $P < .001$). Follow-up tests using Tukey HSD test indicated that HEP, CHO, and PAN had higher SBP than REN, while CHO had a higher SBP than COL (all $P < .05$). However, there were no significant differences among constitution groups in diastolic blood pressure, total cholesterol (TChol), thyroglobulin (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein (LDL), and HbA1c.

The prevalence of MS in the constitutions was significantly different: CHO, 38.9%; HEP, 35.2%; PAN, 18.3%; COL, 11.6%; PUL, 5.0%; REN, 2.9% ($P < .001$). To evaluate whether constitutional diagnosis according to ECM is an independent risk factor for MS, we calculated ORs for MS with a multiple logistic regression analysis. With PUL as the reference, CHO and HEP were at a much higher risk of developing MS than the other constitutions (Table 5). Patients diagnosed with HEP and CHO constitutions were approximately 13 times more likely to have MS than those with PUL constitution. Additionally, older patients were at a higher risk than younger patients.

### 4. Discussion

The purpose of the present study was to investigate the prevalence of, and association between, MS and ECM constitutions. ECM is a typology system for diagnosing humans into 8 constitution groups according to strengths and weaknesses of organs. It can help us to understand and treat physiological and pathological phenomena based on this classification. ECM theory has the advantage of providing a personalized and preventive approach that can provide information about patients’ physical and mental characteristics for managing health through changes in lifestyle. Previous ECM researchers have demonstrated its clinical effectiveness, showing that ECM can promote health through diet therapy and acupuncture.

Our results show that the prevalence of MS was highest in the CHO and HEP constitution groups, followed by PAN, COL, PUL, and REN. Notably, there were no patients with MS in the VES constitution group. Factors that may have contributed to these results include differences between the groups in WC, HDL-C, BP, and TG. Consistent with previous studies using these measures, we observed similar trends in the data.

We observed that body-related factors (BMI and WC) were greatest in the CHO and HEP constitution groups and lowest in REN and VES. A previous study analyzing body shape characteristics for each constitution reported that CHO and HEP constitutions generally include individuals who are tall and heavy; in many cases, these patients were obese. According to ECM theory, individuals with VES have the smallest body type. VES is also associated with the weakest gastrointestinal function and poor digestive enzyme activity to supply energy from consumed food compared with other constitutions. These characteristics may explain the observed small body type.

We also observed that SBP was highest in the CHO and HEP constitution groups, and lowest in VES, PUL, and COL. For DBP, CHO, and PAN constitution groups were the highest, and REN was the lowest. ECM theory has previously suggested that the HEP constitution is associated with high blood pressure. In the present study, individuals with CHO also exhibited high blood pressure, which may have been the result of a correlation between BMI and WC. Consistent with this, the REN constitution group had the lowest blood pressure and had the lowest BMI and WC. These results might indicate the importance of considering BMI and WC.

HDL-C was highest in the VES constitution group, and lowest in HEP and CHO. These differences were statistically significant. However, a previous study of serum lipid levels found no significant differences among ECM constitutions for HDL-C and TG. It is possible that our results differed from those of the previous study because all of their participants were women, and none were diagnosed with VES and REN constitutions. Therefore, further studies including more participants will provide greater clarity. FBS was also high in the HEP, CHO, and PAN groups. ECM theory suggests that the PAN constitutions are associated with a high prevalence of diabetes, and the results of our study showed a trend in support of this idea with similar associations in PAN. However, further research is warranted, because those with HEP and CHO in our sample also had a high prevalence of diabetes.

### Table 5

| Constitution groups | OR      | 95% CI Lower | 95% CI Upper | OR      | 95% CI Lower | 95% CI Upper |
|---------------------|---------|--------------|--------------|---------|--------------|--------------|
| PUL                 | 1       |              |              | 1       |              |              |
| COL                 | 0.52    | 0.19         | 1.40         | 3.83    | 0.41         | 35.67        |
| REN                 | 0.11    |              |              | 0.80    |              |              |
| HEP                 | 3.30*   | 1.65         | 6.58         | 13.03*  | 1.61         | 105.70       |
| CHO                 | 3.07    | 1.12         | 8.40         | 13.19*  | 1.39         | 125.46       |
| PAN                 | 0.96    | 0.47         | 1.95         | 5.02    | 0.61         | 41.64        |
| Age                 | 1.06*   | 1.02         | 1.10         | 1.05    | 1.01         | 1.09         |
| Sex                 |          |              |              |         |              |              |
| Male                | 1       |              |              | 1       |              |              |
| Female              | 0.59    | 0.31         | 1.13         | 0.76    | 0.36         | 1.63         |

CHO = Cholecystonia, COL = Colonotonia, ECM = Eight Constitution Medicine, HEP = Hepatonia, OR = Odds ratio, PAN = Pancreotonia, PUL = Pulmotonia, REN = Renotonia, VES = Vesicotonia.

* $P < .05$; VES was excluded from the analysis due to no observation with metabolic syndrome.

1. Adjusted by age, sex.
Results of multiple logistic regression analysis indicated that patients in HEP and CHO were 13 times more likely to be diagnosed with MS than those in PUL. This result is supported by the fact that prevalence of MS in the HEP and CHO groups was significantly higher than that of the other constitutions. Because both HEP and CHO have beneficial constitutions for consuming meats, eating meats may have contributed to a large physique, as shown in previous studies.\[6\]–\[28\]

Previous studies have reported that following the suggested diet per ECM improved quality of life and could naturally reduce the likelihood of MS.\[27\] Additionally, age was significantly associated with MS, and patients become more vulnerable as they get older. While the patients in our sample did not much vary in age from the mid-50s, samples with a wider age range are needed to confirm the effect of age on MS.

To our knowledge, this is the first study to examine the association between ECM and MS. Additional strengths of this study include the low amount of missing data, detailed metabolic characterization of the samples, and the use of a balanced sample by sex. However, there are some limitations worth mentioning. First, we used a convenience sample from a hospital in which patients’ socioeconomic status was much higher than that of the general population, so the generalizability of the results may be limited. Second, the unequal number of individuals in each constitution group due to the demographic characteristics of our cohort could have impacted the findings. Third, we could not establish causality of such effects due to the use of a cross-sectional design. Future research with larger and diverse samples could extend our results and should evaluate the effectiveness of ECM treatment by comparing groups that do and do not manage MS using diet therapy and acupuncture treatment per each constitution. Additionally, future study should make such diagnosis with 2 doctors and then compute an agreement coefficient such as Kappa in order to further improve accuracy and reproducibility of diagnosis. In our study, the diagnosis of constitutions was made twice by a doctor to ensure accuracy and reproducibility because our study was conducted with 245 people in a single clinic over a period of 5 years. So, it was difficult to use this method this time. Lastly, future studies should also make an attempt to control for any covariates such as a physical activity that might affect an outcome via propensity scoring before the experiment start.

In conclusion, this study shows that the prevalence of MS is differentially associated with the 8 constitutions of ECM, so ECM diagnosis may be a useful method for managing MS. Metabolic syndrome was more prevalent in HEP and CHO, suggesting that the risk of MS is associated with ECM and its dietary recommendations. These findings may emphasize the need to increase attention to ECM and to develop aggressive dietary modifications for patients with those with HEP and CHO constitutions. Innovative management and prevention strategies, if implemented in population subgroups at highest risk, may have a substantial effect on reducing these risks. Our results can inform the design of future ECM studies with larger cohorts, which could improve the early diagnosis and management of MS.

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References
[1] Kuon DW. Berhardt LV. A theoretical basis for the Eight Constitution Acupuncture. Advances in Medicine and Biology, Volume 5 New York, NY: Nova Science Publishers; 2011:243–5.
[2] Kuon DW. A study of constitution acupuncture. J Int Cong Acupunct Moxibust 1965;10:149–67.
[3] Chae H, Lyoo IK, Lee SJ, et al. An alternative way to individualized medicine: psychological and physical traits of Sasang typology. J Altern Complement Med 2003;9:519–28.
[4] Kim YY, Cho RW, Song IB, et al. The clinical effects of Sasang constitutional diets for the hypercholesterolemic patients. Korean J Nutr 2000;33:824–32.
[5] Kuon DW. Studies on constitution-acupuncture therapy. Korean Central J Med 1975;25:327–43.
[6] Kuon DW. Eight-Constitution Medicine – An Overview. Seoul: Institute for Modern Korean Studies, Yonsei University Press; 2003. 1–16.
[7] Lee HS, Lee YB, Shin YS, et al. A pilot study on reliability of pulse diagnosis in Eight-Constiution Medicine. Korean J Meridian Acupoint 2005;22:1–8.
[8] Shin YS, Nah SS, Oh HS, et al. A study on consistency and accuracy of pulse diagnosis in Eight-Constitution Medicine. OPMEM 2009;14:9–14.
[9] The Society of Korean Medicine Diagnostics. Department of biofunctional Medicine of Korean Medical University. Biofunct Med 2008;397–411.
[10] Paik MJ, Kuon DW, Cho J, et al. Altered urinary polyamine patterns of cancer patients under acupuncture therapy. J Amino Acids 2009;37:407–13.
[11] Kim HK,Hong SU. 3 cases of the effect of 8 Constitution acupuncture on allergic rhinitis. J Korean Oriental Med Ophthalmol Otolaryng Dermatol 2009;22:251–60.
[12] Chae SJ, Kim NO, Park YC, et al. Comparison of the improvement of subjective symptoms between body acupuncture group & 8 constitution acupuncture group. J Korean Acupuncture Moxibust Soc 2001;18:48–55.
[13] Kim SU, Jang GJ, Kang YH, et al. A case report on performing 8 constitutional acupuncture therapies for a case of arthrosopic partial meniscectomy. J Dong-Eui Oriental Med 2001;5:67–75.
[14] Kim YW, Lee KM. The effect of 8 constitution acupuncture on neck pain by Pain Disability Index and visual analogue scale. J Korean Acupuncture Moxibust Soc 2003;20:202–8.
[15] Grundy SM, Cleerman JJ, Daniels SR, et al. Diagnosis and management of the metabolic syndrome. An American Heart Association/National Heart, Lung, and Blood Institute scientific statement. Cardiol Rev 2005;11:2735–52.
[16] Wilson PW, D’Agostino RB, Parise H, et al. Metabolic syndrome as a precursor of cardiovascular disease and type 2 diabetes mellitus. Circulation 2005;112:3066–72.
[17] Kaur J. A comprehensive review on metabolic syndrome. Cardiol Res Pract 2014:93162.
[18] Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet 2005;365:1415–28.
[19] Poulsen P, Vaag A, Kyvik K, et al. Generic versus environmental aetiology of the metabolic syndrome among male and female twins. Diabetologia 2001;44:537–43.
[20] Ford ES. Prevalence of the metabolic syndrome in US populations. Endocrinol Metab Clin N Am 2004;33:333–50.
[21] Che BJ, Kim MJ, Kim MJ, et al. Relationship between nutrient intakes and blood biochemical parameters of Korean female subjects classified by Eight Constitution Medicine. J Korean Med 2013;34:143–52.
[22] American Diabetes AssociationDiagnosis and classification of diabetes mellitus. Diabetes Care 2006;29:543–8.
[23] World Health Organization, International Diabetes Institute, International Association for the Study of Obesity, International Obesity Task
Force. The Asia-Pacific perspective: redefining obesity and its treatment. Sydney: Health Communications Australia; 2000.

[24] IBM Corp. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp; 2016.

[25] Shin YS, Min JY, Park YJ, Park YB, Kim MY, Lee SH. A study for Eight Constitution Medicine diagnosis expert system development. J Korean Oriental Med 2008;12:93–154.

[26] Kim SH, Kim WY, Lee PJ, et al. A comparison of nutritional status among eight constitutional groups in relation to food preference on the view point of constitutional medicine. Korean J Nutr 1985;18:135–66.

[27] Jung HJ, Jung SH. The Effect of Constitutional Diet on View Point of Eight Constitutional Medicine. Seoul: Dongguk University; 2006.

[28] Lee SB, Choi KM, Park YJ, et al. A study on the clinical characteristics 8-constitution. J Korean Oriental Med 2002;6:165–85.